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SAULT POWER CANAL.

CHAIRMAN BURTON PRESENTS A LUCID REPORT UPON THE SUBJECT—AN ABLE AND INTERESTING DOCUMENT—TEXT OF THE BILL.

For simplicity and lucidity of statement the report of the committee on rivers and harbors on the Sault power canal bill is a remarkable document. Considering the importance of the subject with which it deals, it is one of the most concise reports presented at the present session of congress. The report in full is as follows:

"The Michigan-Lake Superior Power Co. was incorporated under the laws of the State of Michigan about four years ago. Their plan contemplates the diversion of water from the St. Mary's river in Michigan, between Lake Superior and Lake Huron, by a canal, beginning above the rapids and extending through the city of Sault Ste. Marie for about two miles to a point below the rapids. The intake of this proposed canal is located just above the entrance to the ship-canal constructed by the United States government and leading to locks at Sault Ste. Marie. Through this ship-canal a very large and increasing commerce passes. It is within the scope of the plan of the power company to secure 40,000 effective electric horse power from dynamos operated by turbines. The company commenced their work several years ago, and have already done a very large amount of excavation and of construction. Some correspondence was had between this company and the war department, in which the claim was made by the company that their construction would not in any way interfere with navigation. In view of this representation, no action was taken by the war department to prevent or regulate the construction of the canal, but a board of engineers was appointed to report upon the project. In view of possible danger to navigation, which might arise from the construction and operation of this canal, this committee, in January last, reported to the house a resolution, which was passed, calling upon the war department for information upon the subject.

"On consideration of the report and correspondence transmitted by the war department in pursuance of this resolution, it seemed desirable, in order to protect the paramount interests of navigation, to regulate by statute the use of water by this company and at the same time to grant to them all proper rights. Numerous hearings have been had before the committee, at which all parties interested have appeared, notably the representatives of the power canal company, and of the Lake Carriers' Association, a body controlling the larger share of boats plying upon the great lakes. The plan of the power canal company contemplates the erection of remedial and controlling works in St. Mary's river, the operation of which would prevent a decrease of the flow of water through the government canal.

"The accompanying bill defines the rights of the power canal company and imposes upon them the obligation of maintaining proper levels in all channels, natural or artificial, which will be affected by the opening of their proposed canal. It includes a provision for the selection of a board of engineers who shall report upon the feasibility of their plan and suggest changes and modifications, if necessary. It also includes provision that the remedial and controlling works shall not be constructed, nor the canal opened or operated until the said board shall have considered the subject and reported a plan, which also must be approved by the secretary of war and chief of engineers. In section 4 there is a provision that whenever in the judgment of the secretary of war the operation of said canal and remedial and controlling works, or either of them, injuriously affects or tends to injuriously affect navigation, he shall impose rules and regulations such as may be necessary, and may remove the works of the power company, or any part thereof, and take possession of it and control or prevent the flow of water in said canal. It is thought that the interests of navigation and all rights of the government are sufficiently safeguarded in this bill. The committee regards it as desirable that the rights of all parties be clearly defined, and that it is alike for the benefit of navigation and of the power company, as well as of all other parties interested, that a statute such as that filed herewith be passed, containing provisions and regulations controlling the whole subject. The committee recommend that the bill do pass."

The text of the bill is as follows: Be it enacted, etc., that subject to the express precedent conditions hereinafter mentioned the consent of congress is hereby granted to the Michigan-Lake Superior Power Co., of Sault Ste. Marie, Mich., its successors and assigns, to divert water from the Saint Mary's river into its water-power canal now being constructed at Sault Ste. Marie, Mich., and to construct and maintain in and about said canal suitable works, and to do whatever is necessarily incidental to the operation of said canal for water-power purposes.

Sec. 2. Coincident with the diversion from the river St. Marys into such canal of any of the waters of said river, such company shall provide and thereafter maintain suitable and sufficient remedial and controlling works in the rapids of the river St. Marys of such a character that such canal and the said controlling and remedial works, and the operation thereof, shall not injuriously affect navigation in, and shall not impair or diminish the water level or depth of water in and of Lake Superior, or the channels, natural and artificial, which are now or may hereafter be established or created for navigation purposes; or any natural increase thereof or artificial increase created or sanctioned by the United States, either in Lake Superior or any connecting waterways, including the ship canal and locks at Sault Ste. Marie, Mich., and the St. Mary's river.

Sec. 3. There shall be appointed by the secretary of war, as soon as practicable, a board of five engineers, of whom three shall be officers of the corps of engineers of the United States army, and two disinterested experienced hydraulic engineers from civil life, to whom shall be submitted for their consideration and report the plans and methods proposed for operating such remedial and controlling works and any other portions of the works of said company which may affect any United States works constructed, or the navigation or currents or water levels of the navigable waters hereinbefore mentioned. Such board may, upon the application of any person interested and upon due notice to the Michigan-Lake Superior Power Co., give a public hearing at such time and place as it may designate. The report of such board shall be made to the secretary of war as soon as practicable. Such remedial and controlling works shall not be constructed nor shall such canal be opened or operated until such plans and methods of operation shall have been approved by said board, or a majority thereof, and shall have received the approval of the secretary of war and the chief of engineers, who may make such minor modifications as they may deem necessary.

Sec. 4. Whenever, in the judgment of the secretary of war, the operation of said canal and remedial and controlling works, or either of them, either in themselves or in conjunction with any other canal or canals or works in the United States or Canada, which now or hereafter may exist, is injuriously affecting or tending to injuriously affect any United States works or the navigation or currents or water levels of Lake Superior and the river Ste. Marys, or other channels connected therewith, he shall impose such rules and regulations as he may deem necessary for the operation of said canal and works to prevent such injury, and he may remove said works or any part thereof, or take possession of said canal and works or any part thereof and control or prevent the flow of water in said canal and take such other steps in connection therewith as he may deem necessary to protect the interests of navigation. If at any time he shall cause any of said works or any part thereof to be removed, or shall take possession of said canal or works of any part thereof, or interfere with the operation thereof under the authority hereby conferred, he may, upon request of any party in interest, and shall, upon the request of the canal company, either reappoint the first board herein provided for, or appoint a similar board, to report on the whole subject and recommend such modifications, alterations, additions, or devices as, in the judgment of said board or a majority thereof, shall be necessary to obviate such actual or threatened injury to navigation; and if said company shall not forthwith comply, at its own expense, with the recommendations of the report of any such board upon the approval thereof by the secretary of war and the chief of engineers, all rights hereby granted to it shall be forfeited.

Sec. 5. Neither the secretary of war nor chief of engineers, nor any officer or other person acting under direction of the secretary of war, shall be in any way liable by reason of anything done in the execution of this act. The compensation of the two civil engineers and the expenses of the board, as well as the compensation and expenses of any future board herein provided for, shall be paid by the said Michigan-Lake Superior Power Co.

Sec. 6. Nothing herein contained shall be construed to authorize the Michigan-Lake Superior Power Co., of Sault Ste. Marie, Mich., to impair the existing riparian rights or works of diversion of any other person or corporation; but it is not intended hereby to confer upon any such other person or corporation any rights additional to those now existing, nor to impair the right of the United States to control or regulate such works or riparian rights should the interests of navigation require, nor to prevent the exercise in the future by the United States of any riparian rights that it may now have or may hereafter acquire.

Sec. 7. If at any time an international commission shall be created to investigate and report upon the maintenance of the levels of navigable waters lying between the United States and Canada and the protection of navigation therein, and shall recommend rules or regulations regarding the same which become operative, the secretary of war may require the canal of said company and all remedial and controlling works connected therewith to be operated, maintained, or changed in accordance therewith. If said company shall not forthwith comply with said rules or regulations, all rights hereby granted to it shall be forfeited.

Sec. 8. In case any litigation arises in relation to said canal and works, or growing out of the operation thereof, the case may be tried in the proper court of the United States in the district in which the said canal or any part thereof is situated.

Sec. 9. The right to alter, amend, or repeal this act is hereby expressly reserved.

GOVERNMENT TO PAY FOR PRIVATE LIGHTS.

The sundry civil appropriation bill, which will become a law within a few days now, will contain a clause authorizing the United States lighthouse board to contract with the Lake Carriers' Association, or light keepers, or any other person, for necessary lights on Canadian soil or waters, to light channels improved by the United States government on the connecting waters of the Great Lakes where no permanent lights have heretofore been provided by law. This means that the vessel owners of the great lakes are finally to be relieved of the expense of private lights.

The expense last year for these lights was about $6,000 and this year will be about the same. It is certainly not right that the Lake Carriers' Association should go on lighting indefinitely channels which the government has built at great expense. The method for taking care of these lights provided by this amendment seems to be the only practicable method at the present time. The item referred to will have careful attention from Senators McMillan and Hanna and there is little doubt now of its retention in the appropriation bill.

Mr. Frank J. Firth, president of the Erie & Western Transportation Co. (Anchor Line), says he has no knowledge of the origin of newspaper rumors regarding new vessels to be built for his company. The Anchor Line has not given any consideration at all, Mr. Firth says, to the building of any new vessels to be added to its lake fleet, and no effort is being made to sell the vessels at present constituting the fleet.

SPEED OF 35 KNOTS.

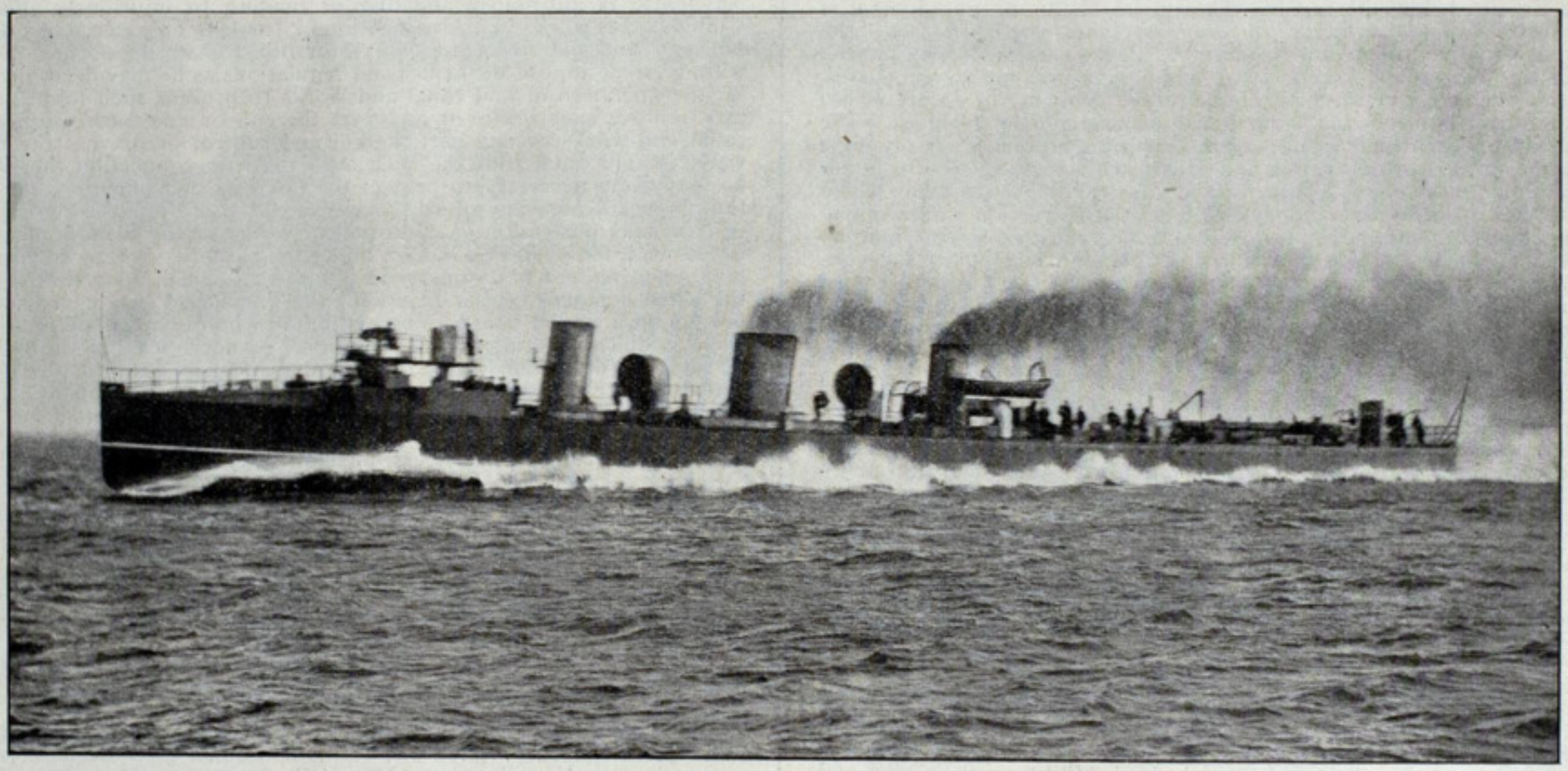
PRACTICALLY THAT FIGURE REACHED BY THE TORPEDO BOAT DESTROYER VIPER, EQUIPPED WITH COMPOUND STEAM TURBINES OF PARSONS' DESIGN.

English journals, just at hand, contain accounts of the official trial of the torpedo boat destroyer Viper, which took place off the mouth of the Tyne. This vessel possesses unusual interest from the fact that her main engines consist of Parsons' steam turbines, made by the Parsons' Marine Steam Turbine Co. at their new works at Wallsend-on-Tyne. The Viper in general arrangement is similar to the later class of torpedo boat destroyers built for the British navy. She is 210 feet long, 21 feet wide, and 12 feet 9 inches deep. The displacement on trial was 370 tons, with all coal on board. The contract load was 40 tons, but, as a matter of fact, the vessel had on board 60 tons. There are four shafts, each having two propellers, or eight in all. The propelling machinery consists of two sets of compound steam turbines for driving the vessel ahead. The first stage of expansion is effected in what may be called a high-pressure cylinder and this drives one of the shafts and two of the propellers. The low pressure cylinder of each engine is attached to another shaft with two more propellers. The steam is, however, expanding continuously; and naturally, with an engine in which steam passes continuously in one direction, and where there is no reciprocating motion, the principles and reasoning that govern ordinary compound steam engine economy do not apply in like manner. There is this similitude, however, that the blades of the turbine, which stand in the place of the pistons of a reciprocating engine, are increased in size as they progress from the admission to the exhaust end of the machine, so that the steam expands and acts on a larger surface as it parts with energy on its passage through the turbine. As the steam turbine cannot be reversed, special turbines are provided for going astern; the speed in that direction being stated to be 15½ knots.

The vessel itself was built by Messrs. Hawthorn, Leslie & Co. at their Hebburn yard, the same firm having constructed the four Yarrow boilers by which steam is generated. The contractors have been exceptionally unfortunate with this vessel, as she has been waiting her trials for a long time. Even when it was decided to go on with the trials the sea was much more disturbed than was desirable. Full speed had not been reached when the vessel entered upon the measured mile, and even on the second run the speed did not quite reach 30 knots. Ten runs were made in all, and taking the best six consecutive runs—of course with and against tide—a speed of 34.28 knots was reached. The best two runs gave a mean speed of 34.75 knots, while the mean speed on a three-hours' run was 33.96 knots. The mean revolutions were 1050 per minute, and the mean steam pressure was 165 pounds to the square inch, the maximum being 175 pounds. In regard to this point, it should be stated that a great deal of steam was lost at the relief valves, which had not been sufficiently screwed down before starting, and began to blow heavily soon after going on the mile. The total heating surface in the four Yarrow boilers is 15,000 square feet, and the grate surface is 257¾ square feet. The air pressure for draught averaged 3 inches on the water gauge. The indicated horse power estimated by the steam pressure and revolutions is taken at 11,000, which shows an excellent performance, even allowing for the efficiency of the engine. The boat had been in the water for some time, and her bottom was said to be by no means clean. The officials of the Parsons' company expressed themselves confident of being able to get 36 knots with a clean-bottomed boat on a fine day, provision being made, of course, for using all the steam and not allowing any to pass away at the relief valves.

Engineering of London says of the new vessel: "The weight of the steam turbine as compared to ordinary engines is as 35 to 53; whilst in regard to space occupied it may be said that the engine room of the Viper is the same size as that of the other vessels of her class, but, of course, there is the additional power developed by the machinery of this boat to take into account. The size of the engine room is, however, hardly a fair basis of comparison, as the space is less occupied than usual. The turbine naturally lends itself particularly well to neat stowage. The diameter of the high pressure cylinder is 35 inches, and that of the low pressure cylinder 50 inches. These are, of course, placed horizontally, and can be laid in the bottom of the boat very snugly. In fact, the high pressure stage is entirely under the starting platform, completely out of sight. The safety and comfort of having no working parts and no reciprocating movements at all is very great, and this is especially noticeable in a heavy beam sea. The absence of vibration is complete. So far as the main engines are concerned, it is only possible to tell whether they are at work by what may be described as stethoscopic measures, a lead pencil placed on the casing giving sufficient indication to show the machinery is at work. Unfortunately, the auxiliaries chiefly consist of ordinary engines of the usual type, which made the usual clatter. Whether it will be possible, as is proposed, to work out a system of electrical driving for auxiliaries remains to be seen; but if it can be successfully done—the dynamo, of course, being worked by a steam turbine—a great improvement will be effected even with gearing used for pumps. Another advantage from the system, apparent in going through the roughest sea during the trip, was the way in which the smaller diameter of the multiple propellers enabled them to be kept immersed even when the vessel was partly rolling and partly pitching in a quarterly sea. The whole of the screws are under the boat, and completely protected by the hull."

The Torpedo Boat Destroyer Viper.



MAKING A SPEED OF PRACTICALLY 35 KNOTS ON HER TRIAL TRIP.

LATEST ADDITION TO NORTH GERMAN LLOYD FLEET.

The Grosser Kurfurst, latest addition to the fleet of the North German Lloyd, arrived in New York a few days ago. The Grosser Kurfurst will be placed in the service between Bremen and New York. She shows a number of improvements as compared with her companion vessels, among which there is especially to be noted one large dining-room, first cabin, instead of two smaller dining rooms as at present in use on the Barbarossa steamers. The dimensions of the Grosser Kurfurst are as follows: Length over all, 581 feet 6 inches; beam, 62 feet; depth, 39 feet. The steamer measures 12,200 tons register, has a displacement of 22,000 tons and a capacity of 12,000 tons dead weight. Her motive power consists of two quadruple-expansion engines, developing an average speed of 15 knots across the ocean. Her first cabin will accommodate 250 passengers; her second, 150, and on the two large between decks a large number of steerage passengers can be berthed. The steamer is provided with bilge keels. The cargo space, of which a large part is constructed as a refrigerator for the transportation of perishable goods, is reached by eight large hatches worked with four hydraulic cranes and eleven large winches. The rudder is moved by two heavy steam engines, of which one is held in reserve and used in case of an emergency. These engines are worked from the bridge by hydraulic power. The electric installation consists of 1,000 incandescent lamps, receiving their electricity from three dynamos. The safety appliances consist in a double bottom running under the whole length of the steamer and in twelve bulkheads extending to the upper deck. The steamer carries twenty-two large life-boats ready for instant use on the awning deck. The motive power consists of two quadruple-expansion engines of 8,000 indicated horse power. The cylinders measure 27⅜, 41, 59 and 83½ inches in diameter, and the stroke is 53⅛ inches. The steamer is moved by two four-bladed bronze screws, making ninety revolutions a minute. The steam is generated in five cylindrical double boilers and two single boilers, with natural draught. The boilers are arranged in two groups with two smoke stacks. The heating surface of the boilers are 26,000 square feet, the grate surface in thirty-six furnaces is 700 square feet, and the steam pressure is 213 pounds.

TRIAL TRIP OF THE PROTEUS.

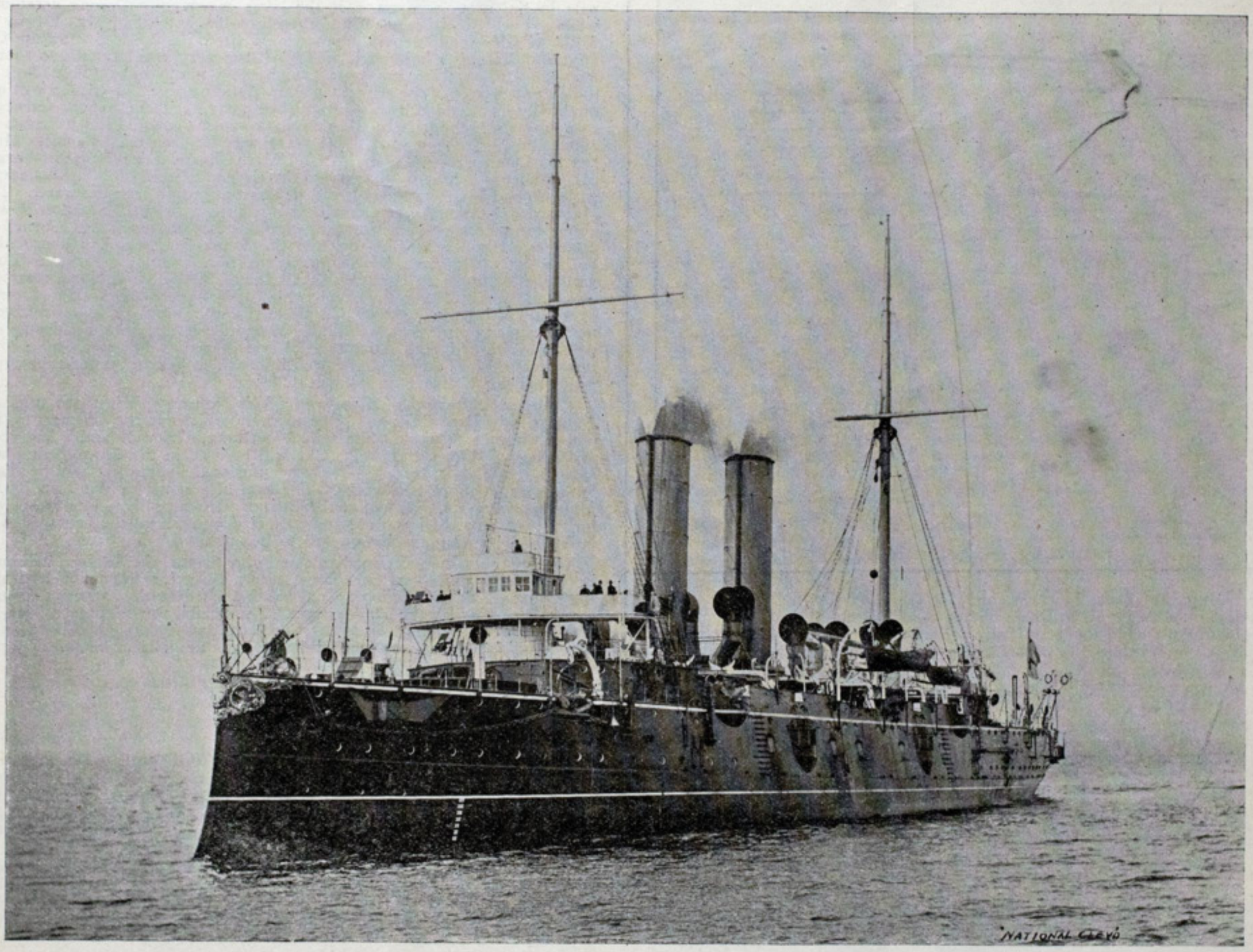
The passenger and freight steamer Proteus, built for the Cromwell line by the Newport News Ship Building & Dry Dock Co., was given her builders' trial on Saturday last. The Proteus left the Newport News yard at 9:30 o'clock and returned at 4:30 o'clock, spending some hours without the Capes testing her engines and gear and seagoing qualities. No attempt was made to speed the ship. The trial test was in every way satisfactory. Among those on board were Gen. Supt. W. A. Post of the ship yard, Mr. Horace See, designer of the vessel, and Mr. W. C. Foley, assistant superintendent of hull construction.

The Proteus is a single-screw steel steamship of 4,828 gross tons. She has three decks and a partial orlop deck, with the hull subdivided into water-tight compartments, and deck-houses of steel. She is 406 feet in length over all, 397.7 feet on keel, 48 feet beam, and 33 feet 9 inches depth of hold. The net tonnage is 3,000. The hull is fitted with bilge keels. The deck-houses are all fitted with either round or square air ports, the round ones being nearly 2 feet in diameter, and the square glass ones much larger. All have heavy plate glass lights. The square ports have small stained glass panels over them, giving a handsome effect in saloons and staterooms. The deck space is exceedingly ample, and there are many fine promenades for passengers, both for first and second-class. The main passenger accommodations include forty-six staterooms for first-class, and about 200 berths in the steerage. The main saloons are handsomely finished in hard woods. The general effect is red and gold, with white and gold ceilings. The electric light fixtures are all nickel-plated. In the dining saloon there are sufficient tables to seat fifty-six passengers with great comfort. Over each table is an electric fan. The first-class staterooms are all heated by electricity, while those of the steerage have steam heat. The pantry is placed aft of the main dining saloon, between it and the galley, which has a shaft over the range so that all odors are carried up and away from the saloon.

The kitchen has a brick floor, and is completely fitted, there being a steam table, steam coffee urns, cold storage apartments, wine locker, annunciator, and the finest of cooking ranges, with all auxiliaries. The china room is large and as completely stocked as a large land hotel. The smoking room is a large and well fitted apartment, with rattan divans, chairs, etc., and specially designed tables, with large skylight dome overhead. The dome over the social hall is of stained glass, of colors that give the effect of the gleam of an iceberg in the Arctic regions when the sun shines on it; this feature will undoubtedly appeal to travelers in the south in mid-summer, and will make the hall an attractive lounging place on warm days.

The Proteus carries eight life boats and three life rafts, with conveniences for rapid handling. There are sixteen large ventilators on the upper deck leading to the fire and engine rooms and lower hold. Throughout the ship a special effort has been made to bring about proper ventilation; all gangways and halls, as well as connecting alleys are of ample dimensions, well lighted and free to the air. In the steerage quarters, as well as those for the crew, as much attention has been paid to comfort as in the apartments set aside for the use of first-class passengers above, and, unlike most ocean steamers, all accommodations throughout are entirely above the water line. There are toilet and bath rooms for the steerage as well as for the first cabin travelers, and bath rooms for the officers and crew, all independent. There are independent mess rooms for officers, sailors, firemen, the steerage passengers, as well as the large and luxuriously furnished dining saloon. The vessel has electric lighting throughout, with call bells, etc., in all parts of the ship. The crew's quarters forward, are in a large and airy room. All facilities are provided for their comfort, including a shower bath.

The motive power consists of a triple expansion engine having cylinders of 32, 52 and 84 inches diameter by 54 inches stroke of piston. Steam is supplied by three double-ended, cylindrical, return tubular boilers, each 13 feet 10 inches in diameter by 20 feet 6 inches long, and built for a working pressure of 180 pounds to the square inch. They have a total of 429 square feet of grate surface and 10,365 square feet of heating surface.



Fine Specimen of British-Built Ship.

CAPT. CRAIG PRESENTED TO THE PRINCE OF WALES.

Capt. Joseph E. Craig, commander of the cruiser Albany, was presented to the Prince of Wales on Monday of this week. Capt. Craig was prior to his assignment to the command of the Albany the chief hydrographer of the navy—a mild-mannered, unassuming courteous gentleman. Capt. Craig spent a vile hour or two prior to his presentation to the prince. His full dress uniform had in some manner become mislaid and the captain ordered out half his crew to search for it. Queries were sent back and forth along the entire express line from Jarrow to London. Those who know Capt. Craig—his modesty, his preciseness and his absolute devotion to form—can comprehend the consternation that he must have experienced when his full dress suit disappeared. The navy department has ordered the Albany to cruise in the Mediterranean for the present. She will be nucleus for the establishment of the European squadron.

Arthur Sewall & Co. of Bath, Me., have secured from the Standard Oil Co. a contract for two four-masted steel ships of about 3,400 tons register each. Work has already been started on one of the vessels and it is probable that she will be ready for launching by the close of the present year.

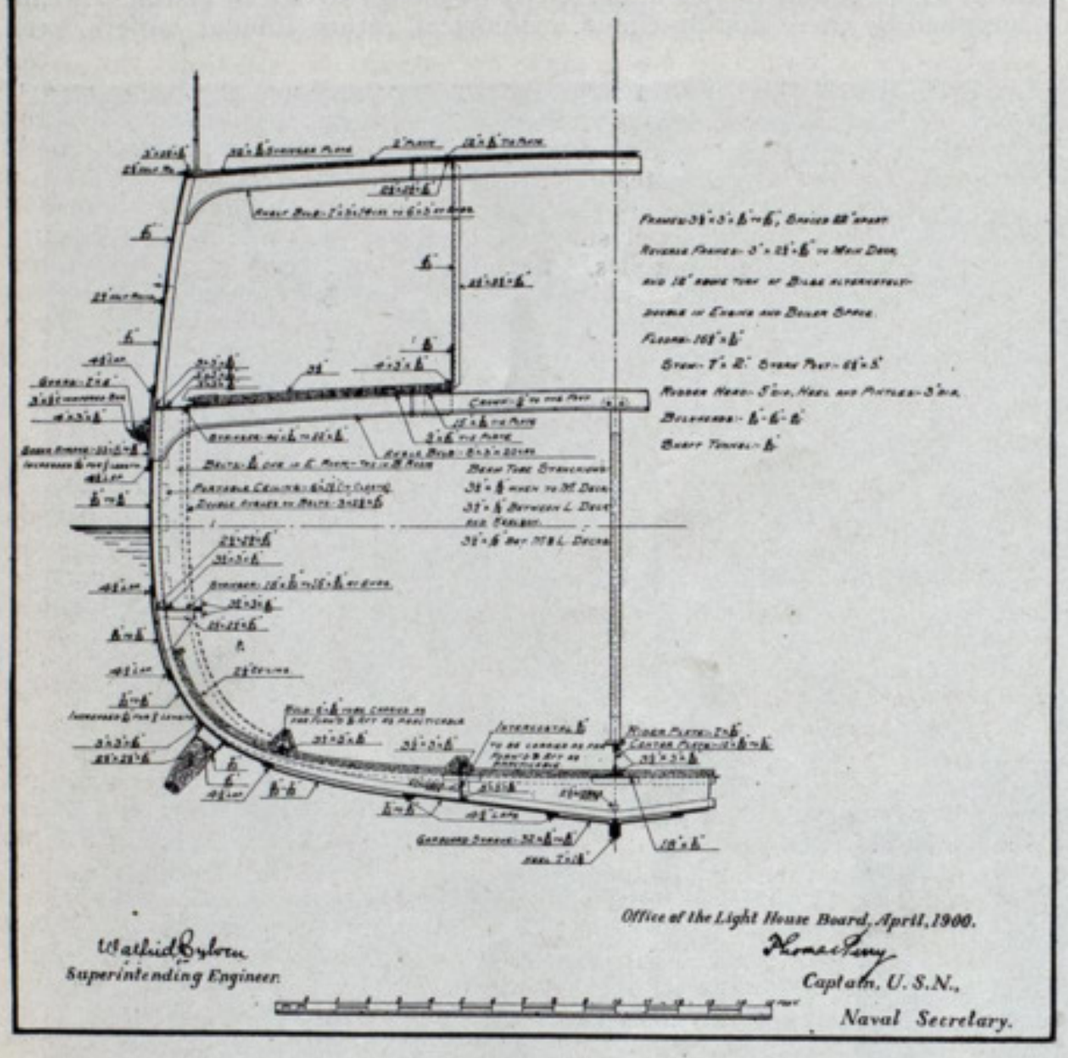
LIGHT-HOUSE TENDER SUMAC.

Proposals have been solicited for the construction of the Sumac, the light-house tender designed for service in the ninth light-house district on the great lakes. This district, with headquarters at Chicago, includes practically all of Lake Michigan. The original bill calling for the construction of this vessel appropriated $85,000. There was much delay in

PLATE 2.

U.S.LIGHT-HOUSE TENDER

—SUMAC.—



Office of the Light House Board, April, 1900.

Walfrid Sylvan
Superintending Engineer.

Homer Perry
Captain, U.S.N.,
Naval Secretary.

preparing the plans, however, and by the time the light-house board caused them to be drawn the price of steel had so advanced that it was impossible to build the vessel within the sum appropriated. The sundry civil act now before the senate makes $50,000 immediately available for the construction of this tender and authorizes an additional $50,000, thus increasing the total sum to $100,000.

The Sumac will be a twin-screw steamer and was designed by Walfrid Sylvan, the engineer for the light-house board. Her dimensions will be: Length over all, 170 feet; length between perpendiculars, 160 feet; depth of hold, 14 feet; displacement, 700 tons; maximum speed, 15 miles. The vessel will have jet condensing engines of 750 indicated horse power with cylinders 18 and 34 inches and a stroke of 28 inches. Steam will be supplied by two Scotch boilers.

The hull will be divided into eight main compartments with four cargo hatches, two large and two small. Elegant quarters will be furnished for the officers and men. The quarters consist of saloon, pantry, chart room, four staterooms and two bath rooms. There will aso be additional quarters for supply clerk, engineer and a working gang of twelve men. Bathing facilities for the men will be supplied in abundance.

The boat will have an extra large supply room for the accommodation of buoys and will have a roomy forward deck. A steam capstan will be fitted aft for towing purposes and the vessel will be equipped with a steel mast from which powerful tackle may be rigged. She will be supplied with a steam windlass, Globe steam steerer (Cleveland make), donkey engine and automatic ash ejector. She will also carry two trimming tanks.

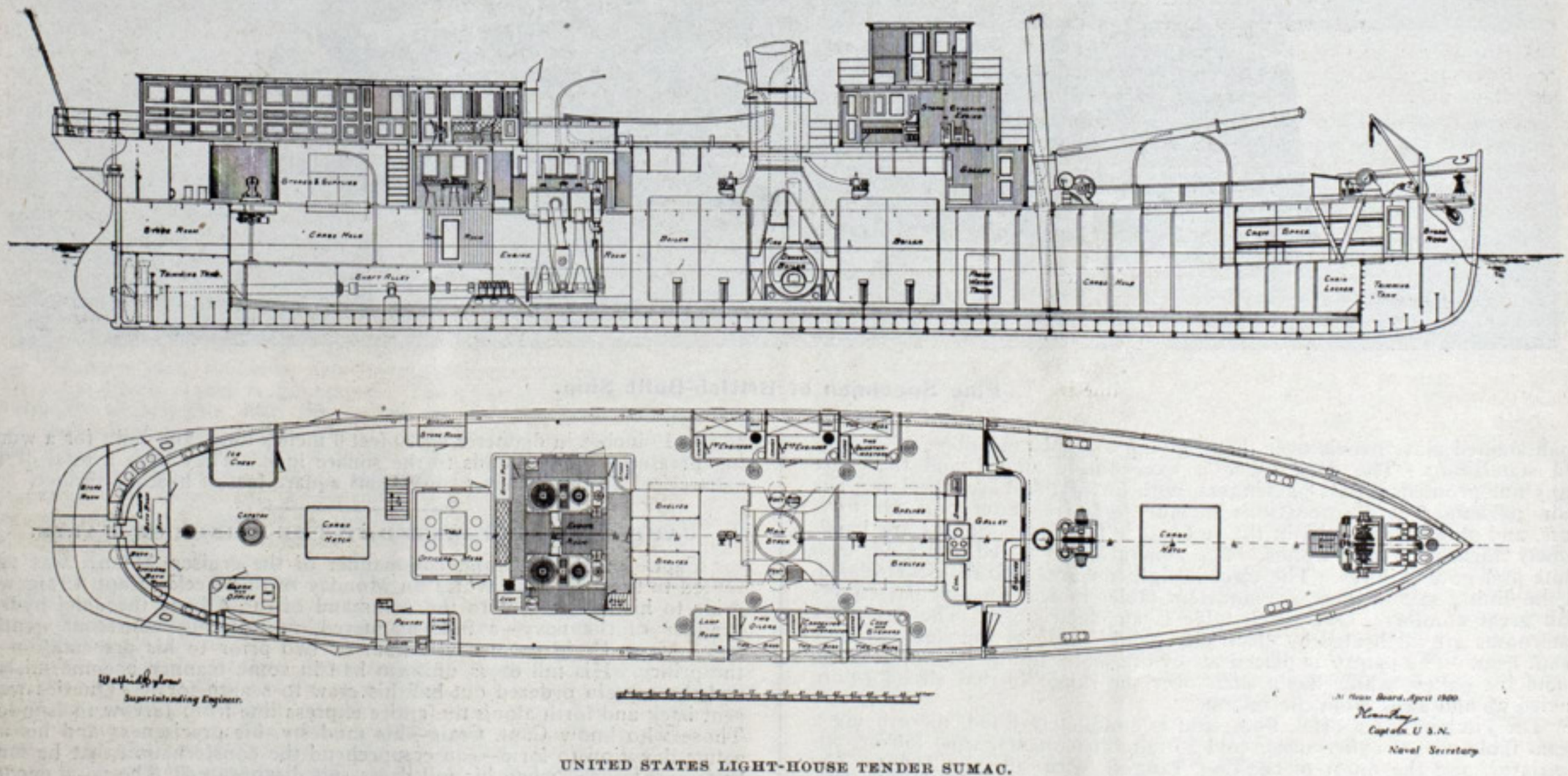
The vessel will be provided with one steam launch and three small boats for work in shallow water. She will be stiff and staunch throughout and is, of course, specially designed for work on the great lakes.

AMONG SHIP BUILDERS OF THE GREAT LAKES.

A ship costing more than $300,000 and destined to play an important part in the great commerce of the lakes is worthy of some ceremony when launched. It is pleasing, therefore, to note that Mr. Edwin S Mills of Cleveland, general manager of the Pittsburgh Steamship Co. (Carnegie interest) has taken pains to issue very neat invitations to the launch of the steamer Lafayette, which takes place today (Thursday) at the Lorain works of the American Ship Building Co. The launch will undoubtedly be attended by a distinguished party of officials of the Carnegie company and their friends. The invitations are accompanied by cards of admission to the ship yard The vessel will be christened by Miss Harriet M. Lauder, daughter of Mr. and Mrs. George Lauder of Pittsburgh. Mr. Lauder is managing director of the Carnegie Steel Co. The Lafayette is the second of the five new Carnegie steamers to go into the water. The Harvard was launched at Detroit several days ago; the Princeton is well along towards the launching stage at the Lorain yard; the Cornell is under construction at Chicago, and the Rensselaer, which will probably be the last of the fleet to go into commission, is building at the Globe yard of the American company in Cleveland. All five of these steamers are duplicates. Dimensions and other leading particulars are: Length over all, 474 feet; beam, moulded, 50 feet; depth, moulded, 28½ feet; estimated capacity on 18 feet draught, 7,300 gross tons; engines, quadruple expansion, with cylinders of 18, 26¾, 41 and 63 inches diameter, and a common stroke of 42 inches; boilers of Babcock & Wilcox water tube type; estimated horse power of engines, 1,950.

Burger & Burger of Manitowoc, Wis., are completing two tugs for Judge Bradwell of Chicago. One of them will leave for Chicago by the end of the present week. She is 74.9 feet long, 17.6 wide and 7 feet deep, and is named James Bradwell. She will be used in the Chicago drainage canal. Her cost is $10,000. The other tug of the same size will be ready for service in about two weeks. The keel of a scow for the Two Rivers Manufacturing Co. was laid at the Burger yard recently. The vessel will be 160 feet long, 34 feet wide and 10 feet deep and will be provided with boiler and hoisting machinery—all to be enclosed.

Another steamer of Canadian canal dimensions, the Ottawa, will soon be engaged in lake service. The Ottawa, built for President Booth of the Canada Atlantic Railway Co., was launched at the Bertram Engine Works Co., Toronto, a few days ago. The launch was witnessed by General Manager Chamberlain of the Canada Atlantic company and a party of officials. The new vessel is 257 feet over all, 43 feet beam, 25 feet 6 inches deep and will carry about 70,000 bushels of wheat on the canal draught of 14 feet. On the upper lake draught of nearly 18 feet she will carry about 105,000 bushels of wheat.



Walfrid Sylvan
Superintending Engineer.

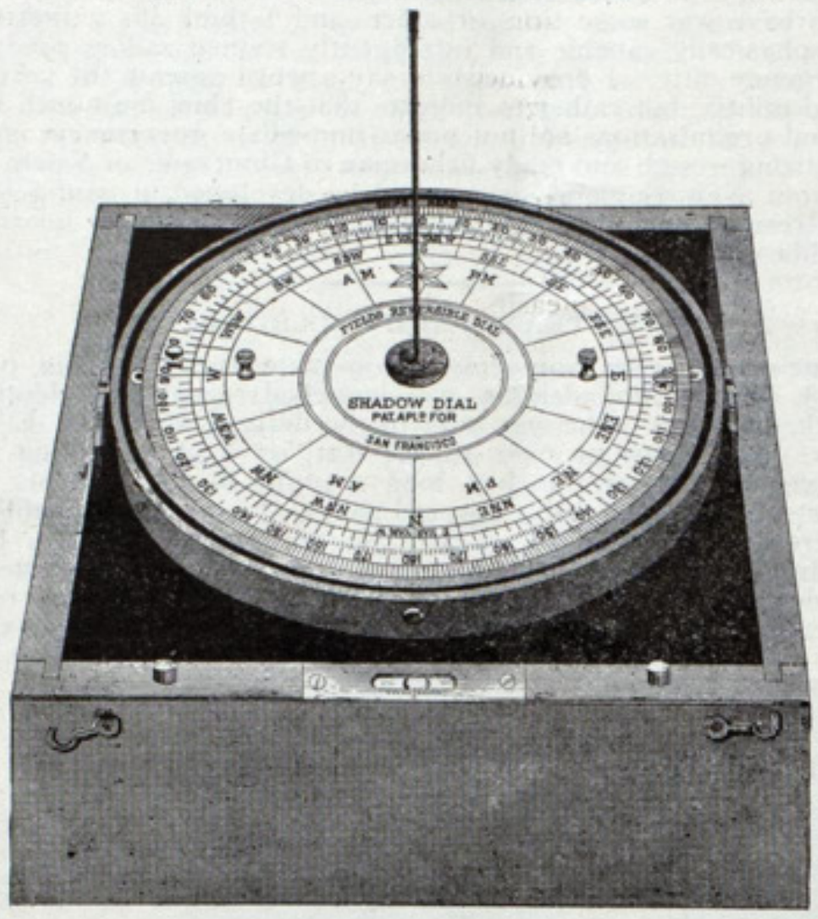
Naval Secretary.

UNITED STATES LIGHT-HOUSE TENDER SUMAC.

About 150 feet of keel, center keelson and bottom plating for the two new Wolvin tow barges, which are to be built so as to withstand ocean service, has been laid at the West Superior ship yard of the American Ship Building Co. Work on these two vessels will be so hurried that they will undoubtedly be completed some time before the close of navigation. June 16 is the date fixed for the launch of the Rockefeller steamer Chas. R. Van Hise at the West Superior yard.

FIELDS COMPASS CORRECTOR.

Capt. John M. Fields of San Francisco, who came to the lakes to introduce his reversible dial compass and course corrector, has just finished a trip to the head of Lake Superior and return with Capt. Wm. Cumming of the Mutual Transportation Co.'s steamer Coralia. Capt. Cumming is highly pleased with the device. He recommends to Capt. Geo. P. McKay, manager, its adoption on all the vessels operated by M. A. Hanna & Co. and says it will very probably soon be in use on all the large vessels of



the lakes. Capt. Fields is now to make a trip with Capt. Chas. B. Galton of the Mitchell steamer W. E. Reis, on which the compass corrector will also be used.

It would seem that with all the trouble and expense that attends the repeated employment of compass adjusters, especially on the great lakes, some device should be found that would at least do away with a large share of this special work. Capt. Fields comes highly recommended by hundreds of the best known ship owners and ship masters of the Pacific coast, including the competent men in charge of government transports. He is so confident of having the instrument that is wanted that he proposes to stay on the lakes all summer in order to properly introduce it. As has already been noted, Capt. Fields says the strongest recommendation for his instrument—designed to ascertain the deviation of compass or to find a true or magnetic course—is its simplicity. It can be operated, he says, without any knowledge whatever of the science of navigation.

AROUND THE GREAT LAKES.

Martin Mullen of Cleveland, who recently sold his lake coal interests to the Pittsburg Coal Co. ($64,000,000 consolidation), sailed for Europe Wednesday and will probably be away for about three months.

Capt. Geo. Tebo, well known to vessel men trading to Chicago, is operating in the south branch of the river at Sixteenth street a steamboat fuel dock from which Indiana block coal is sold. The dock is one which was formerly operated by the O. S. Richardson Fueling Co., and has a frontage of 600 feet.

Two of the Wolvin steamers of Canadian canal dimensions, which are to be built so that they may engage in Atlantic service as well as on the lakes, will be put down at the berth made vacant by the launching of the large Carnegie steamer Lafayette today (Thursday) at the Lorain yard of the American Ship Building Co.

One of the vessels recently purchased in England by Francis J. Clerque, who is conducting a large water power development at Sault Ste. Marie, has arrived on the lakes. Her name is Theano. She brought part cargo of cement across the Atlantic and is now loading at Lorain, O., some steel rails which will also be taken to the Sault.

The Marine Review has made an addition of four pages, giving it forty pages regularly every week. Its growth is a most healthful sign, as it is now double what it was eighteen months ago, and gives a large variety of reading matter and the best and most up-to-date illustrations. The price has been increased to $3.00 a year, but this is none too much, in view of the importance of the paper to marine interests.—Sault Ste. Marie News.

MAKERS OF STEEL FOR SHIPS.

The Review has several times been asked for a list of concerns in the United States that roll shapes and plates for the construction of ships. There are not very many mills suited to this kind of work. The list follows:

Manufacturers of shapes—Cambria Steel Co., Johnstown, Pa.; Carnegie Steel Co., Ltd., Pittsburg, Pa.; Jones & Laughlins, Ltd., Pittsburg, Pa.; Maryland Steel Co., Sparrow's Point, Md.; New Jersey Steel & Iron Co., Trenton, N. J.; Passaic Rolling Mill, Paterson, N. J.; Pennsylvania Steel Co., Steelton, Pa.; Phoenix Iron Co., Philadelphia, Pa.; Roberts Co., A. & P. (Pencoyd Iron Works) Philadelphia, Pa.

Manufacturers of plates—Carbon Steel Co., Pittsburg, Pa.; Carnegie Steel Co., Ltd., Pittsburg, Pa.; Central Iron & Steel Co., Harrisburg, Pa.; Glasgow Iron Co., Pottstown, Pa.; Illinois Steel Co. (controlled by Federal Steel Co.) Chicago, Ill.; Jones & Laughlins, Ltd., Pittsburg, Pa.; Lukens Iron & Steel Co., Coatsville, Pa.; Otis Steel Co., Cleveland, O.; Park Steel Co., Pittsburg, Pa.; Shoenberger Steel Co. (controlled by American Steel & Wire Co.) Pittsburg, Pa.; Worth Bros. Co., Coatsville, Pa.

NAVAL MATTERS.

Orders have been sent to the Portsmouth, N. H., navy yard from the navy department directing that the Monongahela be ready for sea by June 1. These orders do not permit carrying out all the plans for the changes contemplated in the vessel.

Damage done to valuable models of naval ships sent to the Paris exposition has been repaired. Through the courtesy of the French government the work was done under Naval Constructor Gilmore at a French navy yard. The cost of the repairs amounted to about $2,500.

The monitors Puritan and the Gloucester, which have been at Annapolis, will be sent to the Norfolk navy yard for general overhauling, docking and painting, and next autumn they will be sent back to the naval academy where the Puritan will be used in turret drill and the Gloucester in secondary target practice for the cadets.

The monitor Monterey is to go out of commission. After a thorough survey at Hong Kong it was decided that the expense of putting the vessel in shape would be too great. The voyage of the Monterey from Manila to Hong Kong was a surprise to the officials of the navy department. It was supposed that it would be necessary to tow her, and the Scindia was sent along for that purpose. The Monterey, however, made the voyage under her own steam. She left Manila April 6 and arrived in Hong Kong April 9. The voyage was not pleasant, for while there was no sea yet the slightest swell submerged the deck and made necessary the closing of the armor hatches. This, of course, made it extremely hot below. Upon her arrival the ship was put in ordinary, ninety of her crew being turned over to two of the refitted Spanish gunboats, the Austria and Luzon.

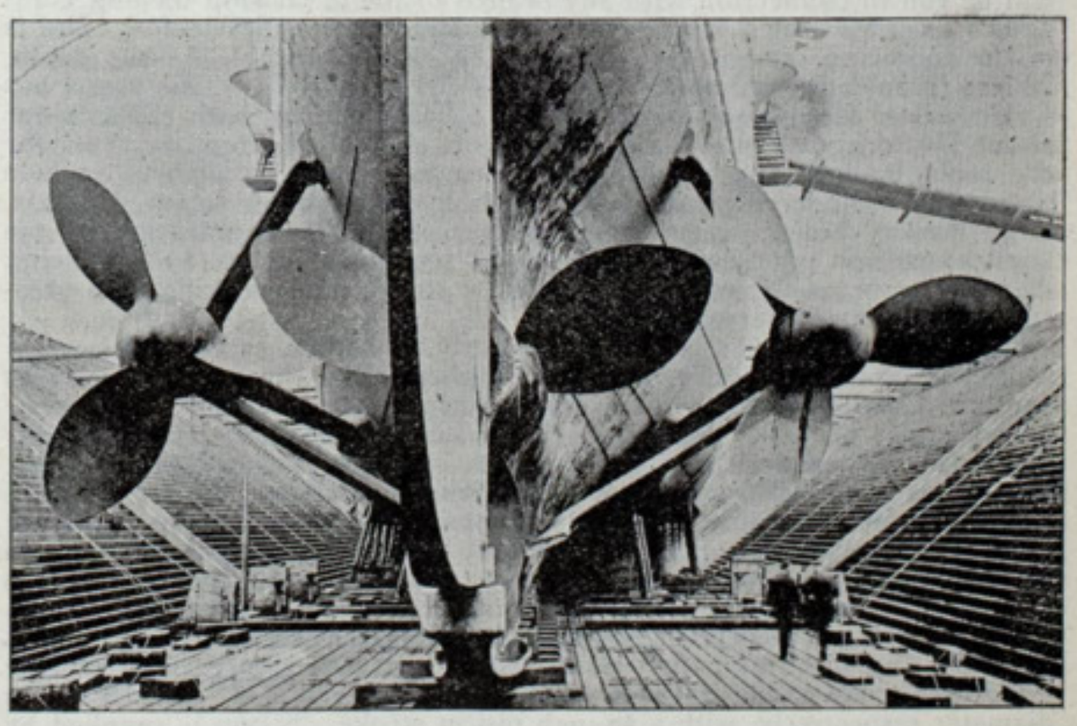
LARGE SAILING VESSELS.

The six-masted schooner which is being built in the yard of Percy & Small at Bath, Me., is an object of great interest to people on the east coast. She is 301 feet 6 inches long on the keel, 50 feet beam and 28 feet deep, and the builders figure that she will measure about 3,000 tons gross and 2,750 tons net. This is larger than some of the big ships launched at Bath in recent years. Bath's latest ships have a tonnage as follows: Roanoke, 3,347 tons; Arthur Sewall, 2,919; Edward Sewall, 2,917; Shenandoah, 3,154; Dirigo, 2,845; Erskine M. Phelps, 2,715; Susquehanna, 2,950. The schooner at the Percy & Small yard has the longest keel ever laid for a wooden vessel on the Kennebec, being 6 inches longer than the keel of the ship Roanoke, the largest wooden sailing vessel ever built for salt water service. The new vessel is not much longer than the Camden-built five-masted schooner John B. Prescott, but she is 6 feet wider and 5 feet deeper, and is expected to carry 5,200 tons of coal to the Prescott's 4,400 tons. The heaviest kind of material is being used all through the ship. The keel is 15x26. A long plate of steel 28 inches wide and 1 inch thick is to be placed in the keels on the whole length between the third and fourth streaks and fastened through and through with 1¼-inch iron every 18 inches apart. The length of the plate is 290 feet. The hull will also be strapped diagonally and have a belt strap of 6.8 steel, 12 inches wide. The keelson is 14x14, nine streaks. The frame is hard wood, oak to second buttocks, hack top and hard wood floor. The ceiling is 14 inches to hanging knees. The planking will be 6 inches. The stem is 52½ feet long.

AUXILIARY ENGINES.

It is well known that auxiliary engines so lavishly provided on war vessels consume such enormous quantities of coal that they only require a few weeks to empty the bunkers of a battleship when in harbor. Sir John Durston endeavored to measure this consumption accurately during the trials of the Argonaut, excluding the steam used by the evaporators, regarding which exact data already existed. The results were as follows:
At 3,600 I. H. P.....22 per cent. of the consumption of main engines.
At 13,500 I. H. P.....10.4 per cent. of the consumption of main engines.
At 18,000 I. H. P.....11.9 per cent. of the consumption of main engines.

It must be noted that on the full-power trial, made under forced draft, eight fan engines were running at full speed, besides double the number of furnace air-blowing engines in use on the 13,500 I. H. P. trial.



Stern View of a Modern Steamer.

The Nickel Plate road offers low rates to Des Moines, Ia., account annual convention Music Teachers' Association. Tickets good going June 17 to 21 inclusive, and good returning not later than June 23, 1900, at one fare for the round trip. Write, wire, 'phone or call on E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 83 June 14.

NEW STEAMERS FOR CANADA.

The four new steamers recently launched in Great Britain for Elder, Dempster & Co., two of which are for the Liverpool-Canadian route, are described with some detail by the British papers. The Montreal is for the Canadian trade. Her principal dimensions are: Length, 470 feet; beam, 56 feet; depth, 42 feet 9 inches (to shelter deck), and she is built to Lloyd's highest three-deck class, besides being specially strengthened on the upper works. She is constructed with a complete shelter deck, extending right fore and aft, which will give a high side and afford a large surplus buoyancy, which, with special features in the design of the model, will insure dryness and steadiness at sea. The officers and engineers are accommodated in large deck-houses. The 'tween decks are unusually high, and fitted for carrying about 750 head of cattle, with large cattle ports and other means of ventilation. Special provision has been made for ballasting the vessel by water, by the adoption of a cellular double bottom, running fore and aft, and two large, deep tanks, also available for cargo, besides the fore and after peaks, all of which are fitted with powerful pumping appliances. The vessel is rigged as a four-masted schooner, and every facility has been provided for rapidly receiving and discharging cargoes, there being twelve powerful steam winches, besides derrick posts and twenty-one derricks. The engines are of the twin-screw, triple expansion type, being built and fitted by the Wallsend Slipway & Engineering Co., Limited, Wallsend. The cylinders are 22, 37 and 61 inches in diameter, respectively, with a piston stroke of 48 inches, and of sufficient power to drive the vessel at a speed of 12 knots at sea. She will carry, when loaded, about 10,000 tons dead weight, and has capacity in her holds and other cargo spaces for about 18,000 tons of measurement cargo. This is the fourth ship of the above dimensions built for these owners.

The Delta is a steel screw steamer, built to the order of the British and African Steam Navigation Co., Limited. The vessel is of the following dimensions: Length between perpendiculars, 195 feet; breadth, 28 feet; depth moulded, 12 feet 6 inches. She has a single deck, with poop, forecastle and house amidships, light sun deck in forward well and at sides of casings, poop and on bridge. Every facility is provided for rapidly working a special cargo by steam crane and winches, and she is handsomely fitted out with accommodation for officers and a few passengers in poop aft. A Tyne firm will supply the Delta with propelling machinery of sufficient power to drive her at a speed of ten knots an hour.

The third vessel is a steel screw steamer named the Sangara, which will be run in connection with any branch of the great ship owning company's business which she may be considered most suitable for. She is of the following dimensions: Length, 325 feet; breadth, 45 feet; depth, 22 feet (moulded); and she is to class 100 A1 at Lloyd's. This vessel has water ballast fitted fore and aft on the cellular system, with capacity for about 750 tons, and she is also fitted with all modern improvements for the rapid loading and discharging of cargo. These appliances include six double cylindered steam deck winches, direct-acting steam windlass, large donkey boiler, steam steering gear, etc. The engines are of the triple expansion type, having cylinders 23 inches, 37 inches, and 61 inches diameter respectively, with 42-inch piston stroke, and working at a pressure of 160 pounds per square inch.

The fourth steamer is intended for the Canadian cattle and general freight trade. She is built to Lloyd's highest class, three deck rule, with continued shelter deck, specially arranged for the conveyance of cattle or horses. Her principal dimensions are: Length, 390 feet; beam, 48 feet; depth (to shelter deck), 36 feet 5 inches, and her deadweight carrying capacity is about 6,500 tons on a light draught of water. Above the continuous shelter deck are the bridge houses. The whole of the decks are of steel. The vessel is fitted throughout with electric light, has seven water-tight bulkheads, and, in addition to the usual water ballast, has also a deep hold tank available for either water ballast or cargo. Her discharging gear, with derrick posts, etc., is specially complete, and she is in every way fitted as a first-class Atlantic cargo steamer. She will be fitted with triple expansion engines, having cylinders 25, 41, and 69 inches diameter respectively, with a 48-inch piston stroke. Steam is supplied by three large boilers, working at 180 pounds pressure.

A contract for the reconstruction necessary to convert the auxiliary cruiser Resolute into a transport has been awarded to the Cramps. The government will spend about $150,000 in fitting out the Resolute and it is believed that she will then be fully equipped for the West Indian service. The Resolute was formerly the Yorktown of the old Dominion line. Being of light draught she is especially adapted for West Indian waters.

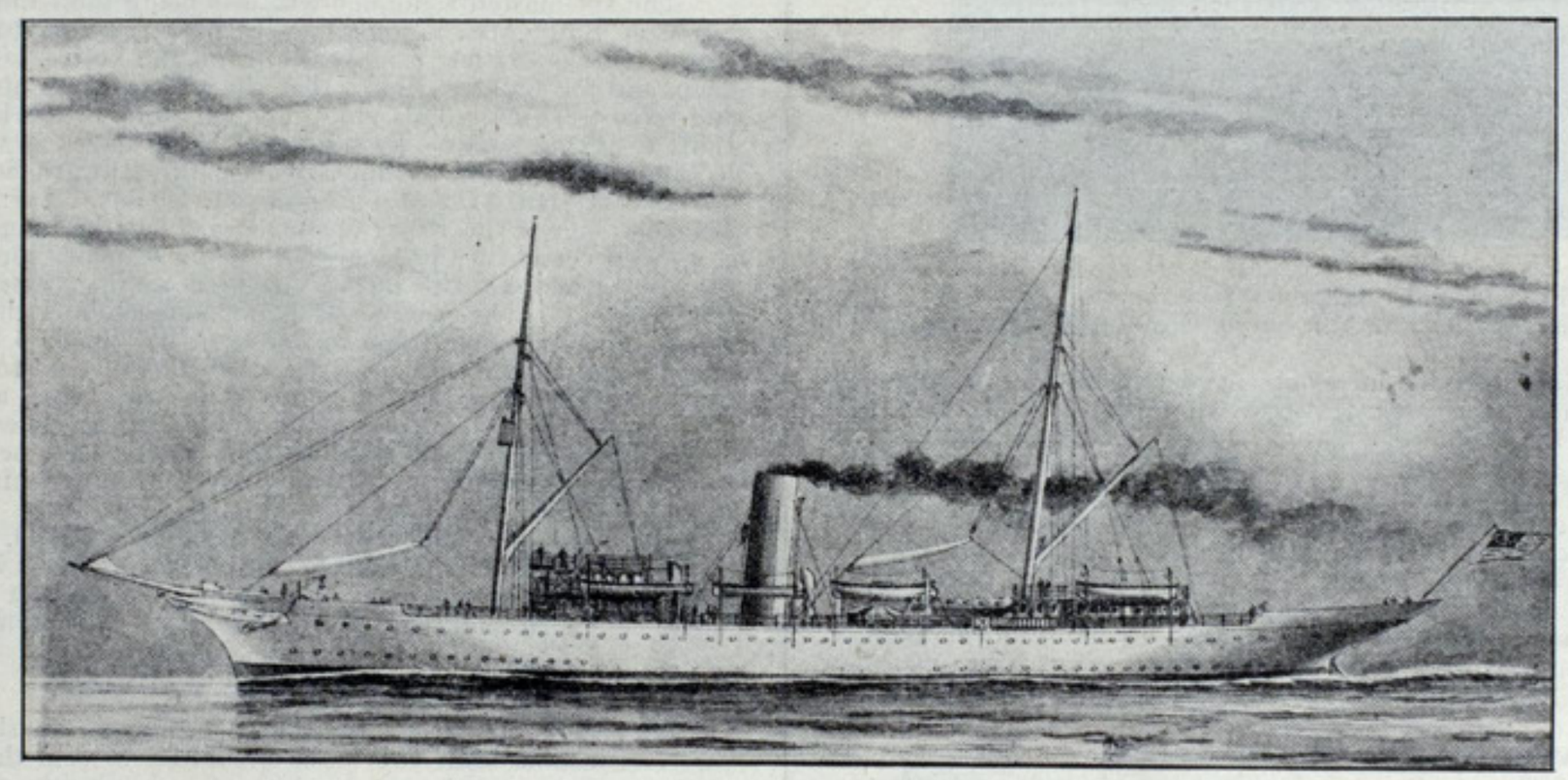
NAVAL RESERVE OF FISHERMEN.

Admiral Sampson in an interview has declared for a naval reserve made up of fishermen.

"For a good many years," the admiral said, "I have been deeply in sympathy with any proposition for the enrollment of our hardy coast fishermen as a naval reserve. These men know the sea better than naval militia men know it. They are toughened, rough-and-tumble, capable, courageous fellows, who may be instructed readily in the requirements of the places they would be called upon to fill in case of trouble. We are going to have war some time or other, and I think it's a first-rate idea to have physically capable and intelligently trained sailors ready always for emergency duty. I don't wish to say a word against the personnel of the naval militia, but rather to indicate that the chief fault with it is that the several organizations are not under immediate government control. A young, strong, rough and ready fisherman of Gloucester or Salem or other port on our New England coast could be developed in winter to a very valuable reserve man with three or four months' work on board ship in the Caribbean."

THE STEAM YACHT MARGARITA.

A fine ocean-going twin-screw steam yacht, the Margarita, owned by Mr. A. J. Drexel, Philadelphia, was launched recently by Scott & Co., Greenock, Scotland. She was built to the designs of Mr. G. L. Watson, Glasgow. She measures over all 323 feet, on load water-line 272 feet, beam, extreme, 36 feet 7 inches, load draught 16 feet 8 inches. She is built of steel, with steel decks covered with teak, and has a double bottom her entire length, with ten water-tight compartments. She has twin screws driven by triple-expansion engines of about 5000 indicated horsepower, designed to give a speed of 17 knots. She will have two large double-ended Scotch boilers, and bunker capacity of 550 tons of coal. She has a complete installation of electric light, and a refrigerating plant capable of turning out 1200 pounds of ice a day.



THE OCEAN-GOING TWIN-SCREW STEAM YACHT MARGARITA.

Her appointments are on a lavish scale; the drawing-room, the entire width of the ship, is in Louis XV. style; the dining room in Chippendale; and the social hall or library in the Empire style. She will have an equipment of rifle calibre automatic guns, and small-arms.

KENSINGTON SHIP YARD COMPANY.

The new ship building company which has acquired the plant of the late Charles Hillman & Sons Ship & Engine Building Co. on the Delaware river at Kensington, Philadelphia, will operate under the title Kensington Ship Yard Co. The company recently acquired a charter at Harrisburg, Pa., and is capitalized at $500,000. The property will be operated as an adjunct of the main Cramp ship building works. The directors will be Edwin S. Cramp, Francis L. Cramp, Samuel Dickson, Harry W. Hand, James H. Mull, William P. Smith, all of Philadelphia, and George C. Thayer of Merion. Mr. Thayer will be the president of the new company, A. H. Bye, secretary and treasurer, F. L. Cramp, manager, and George Clarke, late of the International Navigation Co., superintendent. It is contemplated to make of the Hillman property a yard for the reconstruction and repair of ships and the new company will also carry on the dock and railway business. With this purpose in view it will lease the Cramp dry dock and railway. One advantage to the Cramp company of acquiring the Hillman yard was that it adjoined the Cramp dry dock. Already the fences between the two are down and the properties are now practically one yard. The Kensington Ship Yard Co. was formed because it was thought advisable to conduct the repair, reconstruction and dry dock business entirely apart from the main business of the Cramp company—that of building ships. The yard has a water front of 500 feet and is complete and well fitted for the business intended.

CAPT. FOLGER ON THE KEARSARGE.

The navy department has received a report from Capt. Folger commanding the new double-turret battleship Kearsarge, summarizing the results of the gun practice which the big ship has been making in Lynn Haven bay for the past two weeks. Capt. Folger declares that the results were splendid, that his previously expressed opinion as to the merits of the ship were fully justified and that the electric installation of turrets and loading mechanism were absolutely perfect in their operation. The Kearsarge is now ready for her final trial inspection and Admiral Rodgers and his board will shortly go to Fortress Monroe for that purpose.

ELECTRICAL EQUIPMENT OF WAR SHIPS.

ENGLISH NAVAL OFFICERS ARE STILL SLOW IN ADOPTING THE CREATIONS OF THE NAVAL ENGINEER—MORE PROGRESS IN AMERICA THAN IN ENGLAND.

(FROM ENGINEERING OF LONDON.)

It is nearly a quarter of a century since the first electric projector was installed on a British ship of war, and yet, so slow is mechanical and scientific progress even in this rapid age, it is still doubtful what design of projector is the best to adopt for naval purposes. In regard to all other departments of a vessel in which electricity might possibly play a part, with the exceptions of incandescent lighting and the working of ventilating fans, there is even more uncertainty in the minds of naval officers and constructors. Experiments are being tried in a tentative fashion in our own and other navies, particularly in the latter; but electrical engineers find it very uphill work to impart their own enthusiasm to those who have to use the apparatus they design. The attitude of the naval officer is very easy to understand. The honor of his flag and his own life are staked on the mechanical appliances by which the ship and armament are handled, and consequently every change involves grave responsibility. The apparatus already in use is accepted, with all its defects and limitations, as part of an established order of things, the use of which carries no blame to anyone, even if it sometimes fails to do what is expected of it. In the naval battles of the future breakdowns of machinery will be plentiful enough, due in part to the high pressure at which it will be worked, but more often to its improper handling in the great excitement of the moment, and sometimes breakdown will entail defeat. A scapegoat will then have to be found, and the officer who recommended the adoption of the device which failed will run an unpleasant risk of filling the position. It is no wonder that such men display a very conservative attitude when called upon to endorse the latest creation of the electrical engineer.

The immense difference between the conditions of peace and war was brought out recently in the discussion before the Institution of Electrical Engineers of a paper on "The Electrical Equipment of Ships of War," by Mr. C. E. Grove, the electrical engineer to the Thames Ship Building & Engineering Company, Limited. The author described the hand-regulated lamp of the British admiralty, and also the motor-controlled lamp used by some foreign nations. Mr. R. E. Crompton took this part of the subject as the text of a severe lecture which he administered to the Admiralty on their want of enterprise, and their inability to appreciate the improvements which scientific men placed at their service, until they were obliged to do so in consequence of the action of other powers. There is, of course, an immense amount of truth in what he said, and the point cannot be urged too often or too strenuously. At the same time it was shown that there are two sides to such a question, when a gentleman from Whitehall read from a report of the operations in the Spanish-American war, that it was found much more convenient to direct the projectors by hand, instead of by the automatic apparatus, as then the beam could be kept more steadily on the object under observation. It must be remembered that in the naval operations at Cuba the shooting was all on one side, at least as far as results went, and that the nerves of the American officers were not shaken by the bursting of shells all around them. Under more even conditions of combat it will need a stout heart to stand beside such a tempting target as a projector, in spite of the tradition that it is hard to hit.

In the matter of communication, again, the means which act well when all is quiet, fail entirely in the din of battle. Our vessels are fitted with voice tubes, 2 inches in diameter; but when the guns are being fired, and, indeed, with less violent noises than are produced by artillery, messages cannot be received by them. Loud-speaking telephones are also being tried in our own and several other navies; but it is reported that in the battle of Santiago the Americans found these to be inaudible. As our ships are equipped at present, there is the certainty that messengers will have to be largely employed to transmit orders during an engagement. The position of a captain within a conning tower will then become very difficult, for until he finds his orders being executed, he will never be certain that the messenger has not been killed before he could deliver it. Mr. Grove suggests the use of a system of printing telegraphs, something after the pattern used by the Exchange Telegraph Co., printing in ordinary letters, as the best method of communicating orders. As 20 to 30 words can be transmitted per minute, and as in addition many orders can be coded or abbreviated, this would furnish a safe and fairly expeditious means of distributing orders, although it is to be doubted whether it would always keep pace with the captain's requirements.

Means for working projectors and for conveying intelligence in a ship are, however, matters of minor interest to the electrical engineer. The subject which attracts him is the distribution of power to various parts of the vessel, and he looks forward to the time when the energy required for the whole of the very numerous machines will be supplied by the dynamos. A first-class battleship carries nearly 100 sets of machinery of various kinds, and a first-class cruiser 50 to 70 sets. With the exception of the guns, all were formerly worked by steam, and most of them are still so worked, although in all new ships the electric motor is finding extended application. The most advanced example in this respect is the United States battleship Kearsarge, just completed, which carries fifty-five motors and a generating plant of 350 kilowatts capacity. If this proves a success, it should give a great stimulus to electric driving on board ship, and bring forward for decision the question whether electricity shall not be used in all positions where it is possible. No one would attempt to argue that steam and hydraulic power do not serve their present purposes in the auxiliary machinery of a ship of war extremely well. Indeed, one may go further and state positively that electric motors will neither raise the boats and anchors nor rotate the hoists more satisfactorily than is done at present. But it by no means follows on that account that the present engines and rams will not be superseded in the near future. They are likely to share the experience of the tank boiler. That was a most reliable apparatus when fairly used, and had a dozen merits which do not pertain to the water tube boiler. Yet it has been superseded in all the navies of the world, not because it was unreliable, but because a ship is an engine of war, and must be judged as a whole. Speaking generally, no part of a ship is what its designer would desire if he had a free hand. The armor is not thick enough, the guns are not powerful enough, the ammunition supply is scanty, the speed is too low, and the coal supply insufficient. In every particular the authorities have to content themselves with something far short of perfection, for the simple reason that the ship would not float if they put into it all the arms and appliances which they would like to see there. It is just this consideration which, sooner or later, will lead to the use of electric motors in all the auxiliary machinery of a ship. Their employment will save weight, and the displacement thus rendered available can be applied to other purposes.

Electric motors are not lighter than steam engines of corresponding power; indeed, when the generators and their engines are taken into consideration they are distinctly heavier. But they use far less coal than do the small engines they replace, and the saving they effect amounts to a large weight in a week. Mr. Grove calculates that the total motor capacity required on a battleship would be 1,885 electrical horse power, including duplicates, or 1,385 horse power, excluding duplicates. It is impossible to conceive that all this could be operative at the same moment, even in action. Mr. Grove, therefore, puts the maximum demand at a given instant, including 50 kilowatts for lighting the ship and working the searchlights, at 600 kilowatts. He would provide 800 kilowatts in generators and their engines, and those with steam and exhaust connection would weigh about 80 tons. The weight of the motors would be about that of the engines they displaced, if the saving that would be effected by the substitution of electrical machinery for hydraulic appliances for gun working be reckoned in. Against the weight of the generators and their engines is to be placed that of the main hydraulic equipment of about 25 tons which would be saved. There would also be a slight saving in the weight of the distributing cables and switchboards as compared with the auxiliary steam and exhaust pipes now used. Approximately 55 tons of additional weight would have to be carried, and this can only be economically done if a proportionate saving in coal can be effected.

It is very difficult to say what amount of coal is used by the auxiliary machinery aboard ship, but undoubtedly it is very great, the condensation in the steam pipes alone accounting for a great amount of fuel. Sir John Durston, in his paper on the trials of the Diadem, stated that to run one main feed pump, one blowing engine, one auxiliary circulator, one electric light engine and two distillery pumps consumed coal at the rate of 6.1 tons per day, when two extreme forward boilers were used, or 3.88 tons when two extreme after boilers were employed. The same machines, with the addition of two evaporators, working compound, consumed 8.8 tons of coal per day when supplied by the forward boilers, and 7.09 tons when supplied by the after boilers. That is the length of steam pipe between the forward and after boilers accounted for 2.12 tons of coal per day in the first trial, and for 1.71 tons in the second. What the loss is when really long lengths of steam pipe to the forward and after capstans, and to the steering gear, are in operation has never been determined as far as we know, but evidently it must amount to several tons of coal per day. Again, it has been found that in the Japanese ironclad Shikishima it takes from 3½ to 5 tons of coal to run for 18 hours a day an engine of 65 indicated horse power situated 160 feet away from the boiler, the total range of steam pipe connected being 500 feet to 600 feet. This works out to from 7 lbs. to 10 lbs. of coal per indicated horse power, of which more than half must have been used in keeping the pipes warm.

The consideration of such figures as these, somewhat rough though they may be, endorses the belief that the auxiliary machinery of a battleship, steaming at one-fifth power, accounts for about one-fourth of the coal consumed, say 20 tons a day. Sir John Durston, in his paper before the Institution of Naval Architects put the figure at 22 per cent. when the main engines were giving 3,600 horse power, and this was on a trial in which everything was working at its best. It seems, therefore, reasonable to hope that something like 10 tons of coal might be saved every day a ship was at sea if all the auxiliary machinery could be driven electrically. Thus, by adding 55 tons of machinery to the ship, the coal consumption would be reduced 10 tons a day, or about 12 per cent. at economical speeds. In other words, some 200 tons of displacement would be rendered available for other purposes, such as increased speed, greater radius of action, heavier armament, or thicker armor.

The time is not yet ripe for such a radical change in the equipment of our ships of war; but there is no doubt that the change will come in the near future. It is, however, one of those alterations of which the great benefit cannot be reaped until it is adopted entirely. It is only when a clean sweep is made of long steam pipes, and a properly designed dynamo-room, second in importance only to the main engine-rooms, is provided for in the original design, that full economy will be attained. The greatest obstacle to progress at present is the steering engine. It is a very bad steam eater, and we are not yet in sight of a satisfactory plan of operating it by electricity. The regulation has to be so minute and so absolute, and withal capable of being effected from so many parts of the ship, that the problem bristles with difficulties. Again, the subject of gun training by electricity is far from simple. M. Canet has attained a considerable degree of success, but to do that he had first to carefully balance his turrets so that they moved with far less than the accustomed efforts. He was fortunate that he could do this, because he occupied an important position in the company which constructed the guns. Most inventors would find that the interests of the firms supplying the artillery did not lie in the direction of introducing refinements to eliminate friction. Nevertheless, in spite of difficulties of many kinds, substantial progress is being made, and each year sees electricity playing a more important part on ships of war. But, just as it is rapidly displacing line shafting and belts on shore, so it is destined to take the place of long steam pipes and hydraulic mains on naval vessels, until some day naval engineers and officers will wonder how they endured the heat and mess of the present system, while constructors will thankfully accept the displacement thus rendered available for other purposes.

English ship builders in April launched twenty-five vessels of 52,987 tons gross, against twenty-two vessels, of 69,039 tons gross in March; eighteen vessels of 87,652 tons gross in April, 1898. For the four months English builders have launched seventy-seven vessels, aggregating 188,752 tons gross, as compared with 99 vessels of 248,632 tons gross in the first four months of last year, and 105 vessels of 235,886 tons gross in 1898. In the four months there have been put into the water in the United Kingdom 168 vessels of 331,727 tons gross, as against 203 vessels of 448,015 tons gross in the corresponding period of last year.

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The people of Cleveland will some day understand, if they do not understand now, what a jewel they have in Representative Burton, chairman of the committee on rivers and harbors. It is idle to call him one of the strongest men in congress because in many ways it would puzzle one to find his equal there. He certainly has no equal in the grasp of details. He is without a peer in the thoroughness of his knowledge. He was alone in the Nicaraguan debate but he was right; and many a man who voted against him knew that he was right. Things are not always inspired by wisdom in congress. As chairman of the committee of rivers and harbors Burton is par excellence the man for the place. It is not as spectacular a position as some others but it is doubtful if there is anything in the present congress as important. The labor attached to this office passes all comprehension; yet there is not a question which can be asked regarding the most insignificant of waterways that Burton cannot answer. His knowledge of localities is superior even to that of the representative of the district. Many a congressman has taken issue with Burton over the condition of a harbor in which he was personally concerned only to be routed bag and baggage. He bewilders his opponents by the prodigality of his information. He is rarely stayed nowadays. Burton knows that the simplest way to put a thing is the best way. He makes a child comprehend him. His report upon the power canal bill, which will be found in another column, is an evidence of this. It is a simple statement of a condition which exists. One is conscious that the man who wrote it wants to protect the rights of the government, the rights of navigation and the rights of the builders of the canal.

Owing to the fact that a number of the members of the committee on rivers and harbors have other engagements, the lake trip of the committee has been postponed until July. It is a matter of little consequence as to what month the committee goes; the vital point is that they take the trip. One thing is certain—the men that come back from that trip will not be the same men who go upon it. There is an old saying that one cannot cross Texas and ever be the same man again. The country puts an indelible impression upon him. It is the same with this great body of fresh water and the constant movement of enormous quantities of freight across its surface. They will come back broader and bigger men. The views that they held upon the lakes—largely a blue splash on the map—will never be held by them again. It will be a view of a waterway teeming with ships; ships that are made to hew the line as no ships ever were, daring not to shift 10 feet to the side for fear of losing the channel; millions of money dependent upon following a thin strip of water which happens to be of sufficient depth for the vessel's draught; the entire commerce of the lake passing through one little canal which any accident may block; ore pockets that load a vessel in two hours and buckets that unload her in six; all kinds and conditions of craft moving at the utmost speed, in order to make the most of the season when navigation is possible—all this will the committee see and much more. They will understand then why the "Soo" is greater than Suez and why the Detroit river makes mock of the Mersey.

There are men who hide their lights under a bushel; and there are towns which persistently get in their own way. Such is the case today with the town of Ashtabula. The blood of its body, the breath of its nostrils, nay its very existence, is due to the navigation interests which have centered there. To take away the lake trade from Ashtabula would be like removing the capitol from Washington—the result a waste of sand. If the town of Ashtabula should do one thing more than another that thing is the stimulation of its lake trade. It should do everything in its power to foster it. More than that it should anticipate its needs. Ashtabula, however, is doing the opposite. It is hindering the freedom of navigation at its port. Latterly it caused an ordinance to be passed to cause the swing bridge across the river to remain closed each day from 11:30 a. m., to 12:30 p. m., and from 5:30 p. m., to 6:30 p. m., regardless of the demands of commerce. In these days when boats may receive a cargo in two hours and discharge it in eight or ten, the loss of so much time is suicide. It appears that the bridge engineer declined to enforce the ordinance remained upon the statutes there was nothing for the bridge framers, nevertheless landed him in court. The court held that as long as the ordinance remained upon the statutes there was nothing for the bridge engineer to do but to enforce it. The city council of Ashtabula should repeal this ordinance at once.

A SHIP OR TWO FOR TURKEY.

SAID THAT THE VISIT OF ADMIRAL PACHA MAY RESULT IN A CONTRACT WITH ONE OF OUR SHIP BUILDING CONCERNS—CONSOLIDATION OF NAVY BUREAUS.

Washington, D. C., May 30.—(Special Correspondence).—It is quite probable that the Turkish government will place a contract with some American ship building firm for a new cruiser of the first class. Admiral Ahmed Pacha of the Turkish navy, who is now in Washington, is authority for the statement, and he begins this week a tour of the principal yards with a view to informing himself sufficiently regarding their respective capacities, to make an intelligent recommendation to his home government as to which firm shall be entrusted with the commission. The firm to which the contract will go will depend to a considerable extent upon the promises made as to delivery. The Turkish government is anxious to form the nucleus of a fleet of modern war vessels in the shortest possible space of time and has been impelled to come to America for this cruiser, not only because her officials have been impressed with the quality of naval ship building here, but by reason also of the fact that they believe that under existing circumstances a war vessel can be turned out here fully as quickly as from any of the overcrowded European yards.

Speaking of his observations here Admiral Pacha said: "I am very much impressed with the high quality of the engineering work which is being turned out by plants in the United States. In my opinion the ships, both merchant and naval, which you have turned out during the past few years, are not surpassed by those built anywhere else in the world. Moreover, I see no reason why your larger ship building firms should not meet the best foreign records for speedy construction and turn out a completed cruiser in eight or nine months. Heretofore the British builders have claimed a superiority in this regard and have obtained several orders in consequence."

The admiral will, after leaving Washington, visit the principal Atlantic coast yards, including the plant of the William Cramp & Sons Co. and the Newport News Ship Building & Dry Dock Co. He hopes to be able also to visit the yard of the Union Iron Works at San Francisco, being an enthusiastic admirer of the Oregon and other products of that works, but inasmuch as his stay in America is limited to three or four weeks it is doubtful whether he will be enabled to go to the Pacific coast. The Turkish officials will, however, correspond with the Union Iron Works and the San Francisco firm will be considered in the event of the placing of the contract in America.

The bill introduced into the house of representatives by Chairman Foss of the naval affairs committee providing for the consolidation of the bureaus of construction and repair, steam engineering and equipment of the navy department is, of course, simply the initiatory step towards the consummation of the project which Secretary Long has had in view for some time and which has been outlined in these columns. The bill provides that the duties and business heretofore performed and transacted by the bureaus of construction and repair, steam engineering and equipment be transferred to and shall be performed and transacted by the bureau of ships. In the bureau of ships there shall be two divisions, to be called, respectively, the division of construction and the division of machinery. The hydrographic office is placed under the supervision of the office of the assistant secretary of the navy, or under such bureau as the secretary may direct. The chief of the hydrographic office is to be called the hydrographer of the navy, and to have the rank and highest pay and allowances of a captain in the navy. The chief of the bureau of ships shall be appointed from the lists of line officers or naval constructors not below the grade of commander, and if below the grade of rear admiral shall, while holding the office, have the rank of rear admiral and receive the same pay and allowances as are allowed a brigadier general in the army. The chief of the division of construction shall be appointed from the list of naval constructors, and the chief of the division of machinery from the list of line officers having skill as engineers, in each case not below the grade of commander, and shall, while holding the office, receive the highest pay and allowances of a captain in the navy; and if below the rank of captain, have the rank of captain.

CRUISE OF THE HARTFORD.

The training ship Hartford is now due on the Atlantic coast from San Francisco. During the voyage her crew of landsmen have undergone a severe course in seamanship. After the first month they were placed at the wheel and steered during the day under the direction of the quartermaster. For the entertainment of the crew Chaplain Steele delivered lectures on the life of Admiral Farragut and exhibited the stereopticon and graphophone. Commander Hawley has lately made the following statement regarding the sailing qualities of the ship:

"The ship sails well, but would be much improved if rigged with flying jib and royals on the fore and main. She works in thirteen points and has made nearly ten knots on a bow line. She is slow in tacking, which is due to being too deep in the water, making her sluggish in coming up to the wind. Formerly she drew less water forward by one foot and aft by two feet."

The supreme court of the United States has held that the United States squadron at Manila was superior to the Spanish squadron and that therefore Admiral Dewey and his men are entitled to a bounty on a basis of $100 per man. The contention of Admiral Dewey was that the Spanish squadron, including the shore batteries, was superior to the United States squadron and that therefore he should receive a bounty on a basis of $200 per man. Justice Harlan in giving the decision said that the amount of the bounty depends upon the question whether the enemy's vessel—not the enemy's vessel and the land batteries—was of inferior or superior force. On the whole the decision of the supreme court will meet with general indorsement. It is the common impression of the country now that the American squadron was vastly superior to the Spanish and that the outcome of the engagement, even before it began, was never in doubt. Moreover the whole system of bounty is distasteful. It is a relic of barbarism lingering superfluous on the stage of civilized warfare. The action of congress in recently repealing the law giving bounties to officers and sailors in the navy is to be commended.

WATER TUBE BOILER QUESTION.

NOTHING IN SENSATIONAL STATEMENTS ABOUT THE BELLEVILLE GENERATORS BEING DISCARDED BY BRITISH ADMIRALTY—BABCOCK & WILCOX TYPE OF BOILER SECURING A GREATER SHARE OF ATTENTION.

(From Engineering of London.)

Within the past few weeks the question of the suitability of the Belleville boiler for warships has been discussed in the daily press with that delightful freedom of opinion which usually characterizes the ill-informed and inexperienced "naval critic," and the statements made have been remarkable principally for the drastic nature of the changes portended, according to the view of the writers. Thus we are told that the Belleville boiler is to be discarded, "except for torpedo boat destroyers," that the admiralty intended to appoint a committee of investigation, and that the chief engineering officials at the admiralty are about to resign to make it easy for the board to abolish the boiler and to investigate afterwards its suitability.

In considering briefly these remarkable and reckless statements we shall reverse the order. The resignation of the chief engineering officials at the admiralty, we do not hesitate to say, would be a matter for sincere regret from the national point of view. Under the present staff splendid progress has been made in the improvement of the material of the navy. But for the courage and unceasing vigilance of these officials our warships in point of speed and other qualities could never have kept pace with the needs of the service from the strategical point of view, and any check, in view of the continual progress in foreign navies would be a serious matter. But we are certain that the same courage will operate in determining that a carefully considered, if not an inevitable, policy should not be deserted, even when most vigorously attacked. Credence, therefore, need not be given to statements of resignations, which should perhaps be classified in the category of thoughts prompted by desires.

As to the appointment of a committee, no one would for a moment oppose such a course if it were to result in any satisfactory issue not realizable under present conditions. None of our readers will blame us for any lack of desire to have the fullest investigation into any question of technical importance or interest; we have ever been on the side of research by collective bodies on scientific questions; but the point of importance now to be decided is as to whether the time is not long since past for investigating the general question of policy on the water tube boiler question. Even if such an investigation is to be held it must be on different lines than those suggested. The fact must not be lost sight of that all powers have decided in favor of the water tube boiler for warships, because of its immense strategic value. Naval authorities, the value of whose opinion cannot be doubted for a moment, have pronounced in favor of the change—have stated that it is inevitable, and this must be borne in mind in investigating the question; so that the principle of the water tube boiler must be accepted. That being so, the point narrows itself down to one of carrying the principle of the water tube boiler into practice; and it must not be lost sight of in this connection that every design prepared at the admiralty is submitted to a consultative committee, consisting at present of the chief inspectors of machinery at Portsmouth and Chatham, and the chief engineer of Portsmouth dock yard, the officials who are in daily contact with the machinery in operation in our warships, and thus know from experience the practical results of the working of each ship's engines and boilers. This committee reports upon each design to the first lord of the admiralty.

We have frequently expressed our views as to the Belleville boiler, and need only say here, in view of present criticism, that when it was first adopted it was, and is still, by far the most largely accepted in the navies of the world. The admiralty had a long series of experiments carried out before this type was adopted, and in accepting the boiler their decision coincided with that of other navy authorities. At the same time it was decided to conduct similar tests with all types, and thus, following upon the experimental application of the Belleville boiler in the Sharpshooter, the Du Temple was fitted in the Spanker; the Niclausse in the Seagull; the Mumford in the Salamander; and the Babcock & Wilcox in the Sheldrake—all ships of the same type. These vessels, like the Sharpshooter, were run for thousands of miles, and careful tests made. We have no intention of detailing the results, but they were generally confirmatory of the original decision, as objectionable features discovered themselves in the various types. In the case of the Babcock & Wilcox boiler changes have since been made which have resulted most favorably. The tests of these various types of boilers were made because the responsible engineering officials at the admiralty were anxious to take advantage of the best design which would most conveniently realize in practice the inevitable principle of water tube boilers for warships, and if any system shows an all-round superiority at any time, we are confident that it will be adopted.

As it is, however, the Belleville boiler has continued to hold the field, and not alone in this country. Time and experience bring changes, and it will not be at all surprising to us if the Babcock & Wilcox type should secure in future a larger share of attention and support as a result of the research work carried out in the Sheldrake. Already it has been adopted for a new sloop being built at Sheerness, of 1,400 indicated horse power, and it may be fitted to some of the large ships of this year's programme; but the Belleville boiler will not be replaced, as, when well constructed, and with experienced management on board ship, it has given satisfactory results. It has been said, for instance, that the tubes of the Powerful are to be renewed; that is not so. Only five of her original welded tubes have been replaced by solid-drawn tubes from first to last of her commission, extending over two years and eight months. Again, the statement has been made that, while we are adopting French boilers, other powers having ships built in this country are fitting British boilers. This is equally inaccurate, for the British boilers in question are only being adopted in small torpedo boat destroyers, as is the case with our craft of the same class. The large warships being built in this country for foreign powers are all fitted with the Belleville boiler. Again, it is said that the Belleville boiler will in future be confined to torpedo boat destroyers. As a matter of fact, it has not been fitted to a single one of our hundred odd destroyers, and is not suitable for such craft. We might continue our inquiry into the inaccuracies of the statements made—in some cases in papers which ought to know better; but it is really unprofitable; although it serves to show how much reliance can be placed on the general statement as to the supercession of the boiler, and the resignation of officials—the latter a statement which is as reprehensible as it is inaccurate.

Much that we have said is old news; an apology is almost called for in dealing with the subject, except for possible misapprehension and uncertainty as to the nature of the admiralty administration involved; but we have really been led to a consideration of the subject generally by an interesting return just issued by order of the house of commons to show the cost of repairs to the boilers of the Diadem, Niobe, Arrogant, Furious, Powerful and Terrible since they were commissioned. The return is most suggestive, for these ships have been commissioned for various periods varying from one year and three months to two years and eight months: and the figures give a very good idea of the cost of upkeep of the Belleville boiler. Four of the ships are those fitted immediately after the Sharpshooter experiments established the suitability of the type—the Powerful, Terrible, Arrogant and Furious; and these have not economizers, the other two have this addition. With the exception of the cost in the case of the Terrible the amounts are not by any means exorbitant but it would have been well to have had along with the figures a statement as to the percentage for upkeep on the total cost of the boilers, because outlays of £4,000 or £2,000 may at first sight seem, as one paper has put it, "remarkably expensive" for repairs.

The Belleville boilers cost on an average about 3 pounds 7 shillings per indicated horse power at their full power, which, of course, is got with natural draught This includes uptakes and funnels. It is thus easy to arrive at the total price The first cost of the boiler installations in the Powerful and Terrible averaged about £84,000, and yet the cost of maintaining them in a satisfactory state of repair in the case of the Powerful for two years eight months is only £1,978, or little under 1 per cent. per annum. In the case of the Terrible, the cost is five times greater—due to an unfortunate accident, and not necessarily inherent to the system. Again, the Diadem's boilers cost about £55,600. and her repairs for nineteen months cost £4,218; but those of the sister ship, the Niobe, for fourteen months, only cost £374. It may be that the latter ship has not done the same amount of steaming as the Diadem, although both were in the channel squadron, and both went to South Africa, partly to convoy the troopships and do other patrol duty. The difference, however, is marked. In the worst case the percentage per annum in the Diadem is about 4¾ per cent.; in the other it is much less than 1 per cent. The same difference obtains with the Arrogant and Furious—sister ships of 10,000 horse power. The rate of upkeep in the one case is 6.4 per cent. per annum, and in the other 2.9 per cent. We presume, of course, that in all cases all the repairs necessary within the time are included as suggested by the return.

These percentages speak for themselves; but it is obvious that where there is such disparity in vessels built from the same specification and worked under the same conditions—often in the same services, if not in the same seas—there are influences apart altogether from the principle of the boiler or the design. The admiralty have probably within their knowledge such extraneous causes which operate to influence results. They are not indicated in the return as published, and we have no means of ascertaining such official knowledge. Undoubtedly, experience in the running of water tube boilers is an important factor in economy and efficiency. Long hours in the stoke hold during official steaming trials have made it clear to us that the old haphazard style of stoking and of allowing affairs to run easily will not do with the high pressure system; and it is for this reason that we have urged that the engine complements of our ships should be overhauled. High-pressure steam means greater—almost ceaseless—vigilance, even when running at low powers, and on this must, in part, depend the bill for repairs. A slight flaw, of which no notice is taken, may so develop as to ultimately involve heavy outlay, and unless the staff is adequate such simple slips may be overlooked and bring trouble. Again, it is an open question whether contractors should be allowed to construct boilers on the piecework system. It must not be supposed that in raising this point we are for a moment assuming that the question of workmanship enters into the reason for the repairs bill being large or small—we have absolutely no information on the subject—but general experience supports the view that with piecework there is a great temptation on the part of workmen to "sins of omission and commission." The admiralty some time ago tried to induce contractors to agree to a clause prohibiting piecework on water tube boilers; but the attitude of the men was not favorable, and consideration of the matter had to be deferred. The question is undoubtedly one of extreme difficulty from the point of view of labor economics, but this general reference must suffice for the present.

BELLEVILLE BOILERS—COAL CONSUMPTION.

Following is a report of coal consumption of the latest British war vessels fitted with water tube boilers of the Belleville (French) type:

	Ocean.		Hermes.		Highflyer.		
Duration, hours	30	30	30	8	30	30	8
Boiler pressure	210	258	196	270	214	260	292
I. H. P.	2,767	10,314	2,151	9,203	2,135	7,644	10,344
Coal per I. H. P. per hour	1.84	1.63	1.78	1.52	1.62	1.49	1.407
Speed, knots	11.4	16.2	13.4	20.0	12.5	19.4	20 1

The Ocean is a first-class battleship, and the Hermes and Highflyer are second-class cruisers.

Change of time on the Nickel Plate road.—No. 1 leaves Buffalo at 1:00 a. m. and departs from intermediate stations about one hour later than formerly; No. 5 leaves Buffalo at 12:50 p. m. and is due at intermediate stations about 40 minutes later than formerly; No. 4 leaves Chicago at 3:30 p. m. and is due at intermediate stations about 30 minutes later than the winter schedule. Only a slight change in the other trains at any of our stations. Improvement in sleeping car service both east and west. Individual club breakfasts, luncheons or suppers served in dining cars. Write, wire, 'phone or call on E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 95, June 15

SAFETY SYSTEM OF ELECTRIC WATER-TIGHT DOORS.

BY A REPRESENTATIVE OF THE SPRAGUE ELECTRIC CO., NEW YORK.

A modern seagoing steamship, whether battleship or of the merchant marine, would undoubtedly be considered unsafe if it were not provided with water-tight bulkheads, dividing its hull into several distinct compartments. Inasmuch as the ultimate efficiency of such water-tight compartments depends upon their integrity when an emergency arises, and as every bulkhead is pierced below the water line by one or more openings for entrance and egress, it becomes of the greatest importance to have these openings provided with doors that may be closed quickly, conveniently and surely.

Aside from doors operated solely by hand—and the inadequacy of these has been fully demonstrated—there are now known three methods or systems of power-operated doors: One, hydraulic; two, pneumatic; three, electric.

Doors controlled hydraulically have been tried experimentally upon a United States cruiser. These served to demonstrate very clearly the important advantages of a power door, but owing to many difficulties inherent with the system, hydraulic control has been abandoned. Pneumatic doors are now in an experimental stage. The difficulties attendant upon this mode of control are quite as numerous and as serious as with the hydraulic.

With full appreciation of the defects and limitations of both hydraulic and pneumatic systems, The Sprague Electric Co., No. 527-531 West Thirty-fourth street, New York, presents the "safety system of electric water-tight doors" with perfect confidence that in this system not only are the defects of the fluid systems entirely avoided, but that owing to its many advantages and superiorities, it is the logically correct and ultimate method of door control. The safety door is the invention of Naval Constructor Francis T. Bowles, U. S. N., whose ability and wide experience in the construction of ships and the auxiliary apparatus for use on shipboard makes his judgment on these matters beyond all question. The details of construction and control have been most carefully worked out in conjunction with and under the direction of Mr. Bowles, by the Sprague Electric Co., which has had many years' experience in building automatically-controlled electric devices. The Safety system meets perfectly every requirement for a bulkhead door that has been outlined by authorities on this subject, or found desirable from experience.

First. The door can be raised or lowered by power, or by hand, by one operator at the door on either side of the bulkhead.

Second. It will close either against a rush of water or against a rush of mixed water and coal, or through coal on the door sill due to the first opening of a full bunker.

Third. It is possible to close by power from the bridge, or from one or more central or emergency stations, any desired group of doors, or all the doors simultaneously, or in any degree of succession.

Fourth. There is at each emergency station a positive and reliable indicator by which the closure of each door is made known.

Fifth. The operation of the emergency closing in no way interferes with the local operation by hand or power.

Sixth. The local control by power has precedence over the emergency closure, so that, independent of such closure, a door may be stopped or opened for egress. After the local switch is released the emergency again assumes control and closes the door.

Seventh. The leads which supply power, and which control the doors as well as the operating mechanism, are unaffected by any temperature conditions existing on board ship.

Eighth. The doors have no tendency to "creep," and will remain in any position without expenditure of power to hold them.

Ninth. The power is taken from the main generating plant of the ship, and requires no auxiliary central station or apparatus under continual and wasteful operation.

Tenth. There are no valves, springs or packing, which are subject to continual deterioration and require constant care.

A consideration of the details of construction of the apparatus will show that it possesses simplicity, strength, reliability and durability. There are few parts, and no delicate mechanisms. The door and its frame are very rigid, and will not be thrown out of alignment by warping of bulkheads. The door-rim and frame, and all sliding parts and bearings, are bronze. The motor and controlling mechanism are enclosed in bronze water-tight cases which protect them from mechanical injury, and from water. The driving mechanism occupies but little space, and the controlling apparatus can be so located as to avoid interference with other apparatus. The sliding portion of the door is of steel plate, with bronze rim and rack. The frame is of bronze, which is bolted to the bulkhead. The edge nearest the bulkhead is a plane scraped surface, made water-tight by the action of wedges on the opposite side of the door, which take up in the last one-half inch of travel. These wedges are placed at close intervals along each edge of the door. The door plate carries a bronze rack into which gears a pinion keyed to a horizontal shaft across the guide frame. This pinion shaft is connected through a worm wheel and worm to a shaft extending through the bulkhead, and upon which is mounted the motor armature. For hand operation, cranks are provided which ship over the hexagonal ends of the worm shaft on either side of the bulkhead.

The motor is specially built and wound, so that in ordinary use the power required to raise or lower the door is very small, but when the sill is covered by coal or other obstruction, it is capable of exerting a very powerful effort and will drive the door to its seat.

The controlling mechanism includes controller, hand switch, automatic limit switch and emergency switch.

Controller—This consists of two magnetic switches which govern the circuits of the driving motor. The switches are closed electrically and are opened by gravity when the current is cut off. One switch controls the upward, and the other the downward motion. The only moving portions of this controller are the solenoid "plungers," which carry solid copper contacts on flexible phosphor-bronze springs. These contacts make up against carbon blocks held in solid studs. All arcing when the motor circuit is broken is taken on these carbon blocks, which, as the carbon wears away from continued use, can be adjusted in their studs. The contact with the carbons is independent of this wear, over wide range, on account of the copper contacts being mounted on flexible springs. There are no pivots or pin joints, and no delicate springs or parts that require skill in adjusting.

Hand Switch—This is a three-point switch operated by a shaft that passes through the bulkhead and carries a handle on each side. A movement of the switch handle to the right or left is all that is required to operate the door up or down. As long as the handle is held in one or the other position, the door continues to move. When released it is returned to its central position by a spiral spring and the door is immediately stopped. The contacts are simple and sure, and the handle is made especially heavy to withstand rough usage.

Automatic Limit Switch—This consists of two arms carried on a shaft which is connected to and driven by the main pinion shaft of the door. These two arms engage with switches which are opened, cutting off current and thus stopping the motor when the door has reached its extreme upper or lower positions. These arms are adjustable upon their shaft so that the limits of motion of the door can be accurately determined when installed. After being adjusted, no further care is required.

Emergency Switch—The emergency switch for closing the door from a distant point consists of a standard push button snap switch placed in a suitable case, which also contains the indicator. This is a small incandescent lamp, which, when lit, illuminates the circular glass "bull's eye." All connecting wires from each electric fixture are brought to a central junction box, which forms a central station for connecting the circuits or testing them out. All enclosing boxes are fitted for receiving iron pipe connections.

A standard No. 1 vertical door was erected in 1899 for trial tests at the Brooklyn navy yard. This was subjected to the most severe tests, extending over long periods, all of which it withstood most successfully. Without a particle of attention or adjustment, the door was operated many times a day for five months, and was closed many times through coal piled over the sill and through other obstructions. This same door, without any change or repairs whatever has been sent to the Paris exposition, at the request of and under the auspices of the United States government.

After an exhaustive test and examination by a special commission appointed by the secretary of the navy, these doors were recommended for and installed upon the United States steamer Atlanta, where they are now in service. Installations have been made also on the steamer St. Paul of the International Navigation Co.'s fleet, and others are in progress and under advisement.

EASTERN SHIP BUILDING COMPANY.

(From the Commercial and Financial World.)

It would scarcely be possible to attach too much importance to the work that has been taken in hand by the powerful corporation known as the Eastern Ship Building Co., of New London, Conn. This company was incorporated in March last under the laws of New Jersey with a capital of $500,000, in shares of the par value of $100 each, for the purpose of carrying on a general steamship building business.

The gentlemen identified with this undertaking bring to bear great ability and long experience in this line of work, and it seems to be a foregone conclusion that they are destined to achieve brilliant success. Mr. Charles R. Hanscom is president of the company and Mr. John Sherman Hoyt is secretary and treasurer. Mr. Hanscom is well known in connection with ship building work, having been for twenty years connected with the Bath Iron Works at Bath, Me. He will devote his personal attention to the business of the company at the works, making his headquarters at the New London office, which is the main office. Mr. John Sherman Hoyt, the secretary and treasurer of the company, is a man of very high standing in financial and business circles. He is treasurer of the Dudley company, director of the Jackson & Woodin Manufacturing Co., vice-president of the Nevada Central Railroad Co., vice-president of the Nevada company, etc., etc. Mr. Hoyt takes personal charge of the financial affairs of the Eastern Ship Building Co., and makes his headquarters at the company's New York offices just opened in the Stokes building on Cedar street.

The board of directors of this company is composed of men of wealth and standing and is an exceptionally strong one. The company is erecting new shops and buildings at New London, and when everything is finished they will have the finest and best equipped plant of the kind in the United States. They have just begun work on a contract with the Great Northern Railroad Co., involving the building of two immense steamships for freight and passenger service from Pacific coast ports. They will be the largest vessels of their kind in the world. They will be 625 feet long, 73 feet beam and 53 feet deep. They will be of 19,000 tons registered tonnage and 33,000 tons displacement. They will be fitted with all the latest and most important improvements and are to be finished in two years.

It is learned that the company's plant will be finished by July 1, 1900, and they will then be prepared to undertake the construction of vessels of every kind, for either business or pleasure purposes. The company will bid for government work whenever there is any to be given out, and there is no doubt but they will secure a fair share thereof. They will have a large force of the best workmen in the country, and their facilities and equipments being all entirely new and up-to-date in every sense of the word, they will be able to get out high-class work as cheaply as any concern in the United States. The establishment of a great plant of this character means a great deal to New London, and it is proper to add that the gentlemen concerned have shown singularly good judgment in their selection of that port as their headquarters.

NEW TUBE COMPANY ORGANIZED.

The Empire Seamless Tube Co. has been incorporated with a capital stock of $5,000,000 for the manufacture of metal tubing, steam, gas, and water pipe, locomotive, marine, tubular, and stationary boiler tubes, hollow shafting, axles, bicycle tubing, structural steel tubing, trolley poles, piers, oil-well tubing, gas and oil pipe lines, artesian well casing and seamless steel tubing, heavy hydraulic tubing and pipe, generally for commercial uses. A site at Depew, near Buffalo, has been selected and the plant will be constructed by H. K. Flagler and Charles H. Twist. The company contemplates the building of other plants in different sections of the country to use the seamless process for which is claimed reduced costs of production.

A MODERN WOODEN PASSENGER STEAMER.

About fifty years ago when East Boston was in the zenith of its glory as the home of the famous clipper-built ships of that period, Donald McKay built the famous old ship, the Great Republic, one of the largest wooden ships ever constructed in New England at that time, says the Boston Globe. Great public interest was manifested in the enterprise, and the career of the Great Republic was followed by the people of the New England coast with much interest. Everybody is familiar with the history of this most famous vessel of those great days of the ship building industry in New England.

Today there is in process of construction in East Boston, at the yard of William McKie, on Border street, a wooden steamship as remarkable in this time as was the Great Republic in her day. The new craft is to be named the City of Rockland, and she is being built for the Boston and Bangor Steamship Co. The new steamer is one of the largest wooden vessels ever built in Massachusetts, and is considerably longer on the keel than was the Great Republic. The latter was a trifle longer over all than this new craft, but the measurements of the older craft took in the overhang of the bow and figurehead, so that in reality the new vessel is much longer than she was. The new steamer is the equal in length of any wooden steamer built in New England, though some have been constructed of slightly wider beam in proportion to the length, so that she cannot truthfully be said to be the largest wooden steamship ever constructed in New England. However, the timber used in the construction of her keel and keelsons—as well as the planking, it is claimed—is the longest ever used in any vessel ever constructed in New England. Every day the old shipbuilders of East Boston who visit the yard fondle the great lengths of planking before they are sent abroad to be used in the ceiling of the craft, and talk of the changes over the timber used in the old days. Years ago oak and pine were thought the only materials for such work, and when the revenue cutter Manning was being built at the Atlantic works a couple of years ago, much talk was created over the fact that Oregon fir was used in the sheathing instead of the customary pine. This was made all right by the showing of the government tests, which proved that the fir had a greater strength than the pine, and the fir is being used more in later vessels.

All of the planking used in the City of Rockland averages 74 feet in length, and some of the planks run nearly 90 feet, while none are less than 70 feet. The keel, stem and stern posts are of oak of unusually long lengths, and the keelsons, ten in number, are of Oregon fir, 14 by 14, and are also of exceptionally long timber.

The new vessel is 300 feet over all in length, 38 feet beam over hull and 62 feet over guards, and will have a depth of hold of 14½ feet from the main deck. From the main to the saloon deck will be a rise of 9 feet, and from that to the hurricane deck will be 8½ feet more, and there will be the same rise from the latter to the gallery deck. The large number of keelsons in the vessel are for strength and stiffness. The vessel is fitted with steel diagonal strapping from the gunwale to the saloon deck, and this connects with the hog frames and belt. All of the drilling is being done with the pneumatic drills. The outside planking will be of oak and Georgia pine, except the gunwale streaks, which will be of Oregon fir.

The keel was laid down last fall, and she is to be launched the latter part of August. The owners are in no hurry for her, and she will not go into commission until next spring. She is a side-wheel boat, driven by beam engines of the most improved type. Her passenger capacity will be about 700, though where state rooms are not necessary she could carry from 1500 to 2000 passengers. She is more a passenger than a freight boat, for her freight capacity will not be much over 600 tons. She is to be furnished in much the same style as the City of Bangor, and is to be equipped with two separate electrical plants, steam steering and windlass gear. Such a steamship will be able to carry a first-class license for about twenty-five years and will have a life, barring accidents, of between forty and fifty years.

REMARKABLE SCHOONER FLEET.

A remarkable fleet of schooners to come to a river port, far from the sea, is now lying in a dock at Bangor, Me., where in former times were assembled the proudest square-riggers that Maine yards could produce. The square-riggers used to go there to load deals (spruce planks) for Europe; the schooners, most of them larger than any of the old ships, go there with cargoes of coal and some of them will take away Penobscot river ice. The fleet referred to is composed of the five-masted schooner Governor Ames, 1,689 tons, and the four-masters John F. Randall, 1,585 tons; Malcolm Baxter, Jr., 1,530 tons; Mary Adelaide Randall, 1,108 tons; Katherine D. Perry, 1,015 tons; and Elvira J. French, 902 tons, net register, making a total of 7,829 tons for the six vessels, an average of 1,304 tons each.

The Governor Ames is the first five-masted schooner ever built. She was launched in Waldoboro in 1888, and registers 1,689 tons net. She is in many ways a remarkable vessel, having made nearly as many deep sea voyages as most ships of her age. She went around the horn when practically new, and for some time carried Oregon pine in the Pacific, making several passages in quick time from Puget Sound to Australia, and back from Newcastle, N. S. W., with coal, besides some trips down the California coast. When she came back to the Atlantic, after some years of successful business in the Pacific, she brought 1,650,000 feet of Oregon pine from Port Blakeley to Liverpool, and she made a fine passage, beating several British ships and one American ship, and making as good weather of it as any of the square riggers. She has twice come within an ace of being lost on the Maine coast, but escaped without serious damage, and is now in as good condition as many vessels of half her age and quarter of her hard knocks. There are bigger five-masters, and a few bigger four-masters than the Governor Ames, but no big schooner ever built has a better model. The old Nantucket whaler who brought her to Bangor on her first trip some time ago, declared that she steered like a pilot boat.—Exchange.

The Nickel Plate road will sell excursion tickets to Philadelphia, Pa., June 14 to 18 inclusive, at one fare for the round trip, account Republican national convention. Tickets are good returning to and including June 26, 1900. Write, wire, 'phone or call on E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 82 June 14

IRON AND STEEL TRADE

Exaggerated importance is now being given to everything of a bearish character concerning the iron trade. The temper of buyers is so influenced by these conditions that it is impossible to expect any improvement in the situation until some decided change is made to affect the entire trade. Conditions have changed remarkably within a few short months. We have passed from apparent scarcity of all kinds of raw material and finished products to a superabundance of everything. It is not long since it was exceedingly difficult for furnace companies to secure satisfactory supplies of coke. Furnaces were being operated irregularly because the producers of coke were unable to furnish sufficient quantities to keep furnace plants in operation to their capacity. It is now found that coke can be had in abundance, and the price of this essential material has been reduced. The same conditions present themselves upward through the line of raw products and finished iron and steel.

It therefore appears under the circumstances that the time has arrived when the production of iron and steel should be sharply curtailed. The movement to reduce production has already been made in some directions, and it is understood that much more will be accomplished in this way in the immediate future. Quite a number of proprietors of blast furnaces, who have made considerable money during the past year, have announced that it is their intention, just as quickly as they see that iron is accumulating on their hands, to blow out their furnaces, and not run the risk of losing a large part, if not all, of the profits they have just secured. Manufacturers of finished products are also shortening their time in various parts of the country, and are arranging their operations to correspond with the changed conditions in the market. It is much better for a movement of this kind to be conducted even regardless of concerted action among all in the trade, and thus put production in line with the reduced demand, than to continue in full operation and accumulate stocks to be forced on unwilling buyers, with the inevitable effect of very greatly reducing prices.

The condition of the country generally is so satisfactory, and so many arguments can be advanced of an exceedingly encouraging character, which might even lead to the presumption of a possible improvement in prices if buyers were to have their confidence restored, that it seems timely to call attention to the evident necessary means of bringing about a better condition of the trade. It is a good time to go fishing, as a prominent iron manufacturer says, and wait patiently for the change for the better which is desired. No improvement can certainly be expected if manufacturers persistently force their products on the market.—Iron Age.

NAVIGATION INTERESTS SAFEGUARDED.

There is printed herewith the original order issued by the secretary of war in November, 1897, with respect to certain changes in the Chicago river then projected. This document is referred to in the preamble of the order issued May 8, 1899, but it is only now made public. A copy of it was secured from the secretary of war by Mr. Frank J. Firth and other representatives of the Lake Carriers' Association who recently made an appeal for relief from hindrances to navigation in the Chicago river caused by the opening of the Chicago drainage canal:

Whereas by section 3 of an act of congress approved July 13th, 1892, entitled "an act making appropriations for the construction, repair and preservation of certain public works on rivers and harbors, and for other purposes," it is provided that without the permission of the secretary of war it shall not be lawful to build any wharf, pier, dolphin, boom, dam, weir, breakwater, bulk head, jetty or structure of any kind outside established harbor lines, or where no harbor lines are or may be established, in any port, roadstead, haven, harbor, navigable river, or other waters of the United States, in such manner as shall obstruct or impair navigation, commerce, or anchorage of said waters; or to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of any port, roadstead, haven, harbor, harbor of refuge, or inclosure within the limits of any breakwater, or of the channel of any navigable water of the United States, unless approved and authorized by the secretary of war; and

Whereas the Sanitary District of Chicago has submitted to the secretary of war for his approval certain plans for the widening of the Chicago river between Quincy and Harrison streets of said city by the construction of by-passes and docks; now, therefore, this is to certify that the secretary of war hereby approves and authorizes the work shown on said plans upon the following conditions:

1. That while the general plan is approved, the Sanitary District of Chicago must furnish plans in triplicate on an enlarged scale showing each proposed new bridge, each by-pass and each new dock or wharf proposed to be built, in order that the secretary of war may act intelligently in each case.

2. That this authority shall not be interpreted as approval of the plans of the Sanitary District of Chicago to introduce a current into Chicago river. This latter proposition must be hereafter submitted for consideration.

3. That it will not cover obstructions to navigation by reason of this work while in progress or when completed.

4. That the United States shall not be put to expense by reason of this work.

5. That this authority will expire by limitation in two years from date unless extended.

Washington, D. C., Nov. 16, 1897.

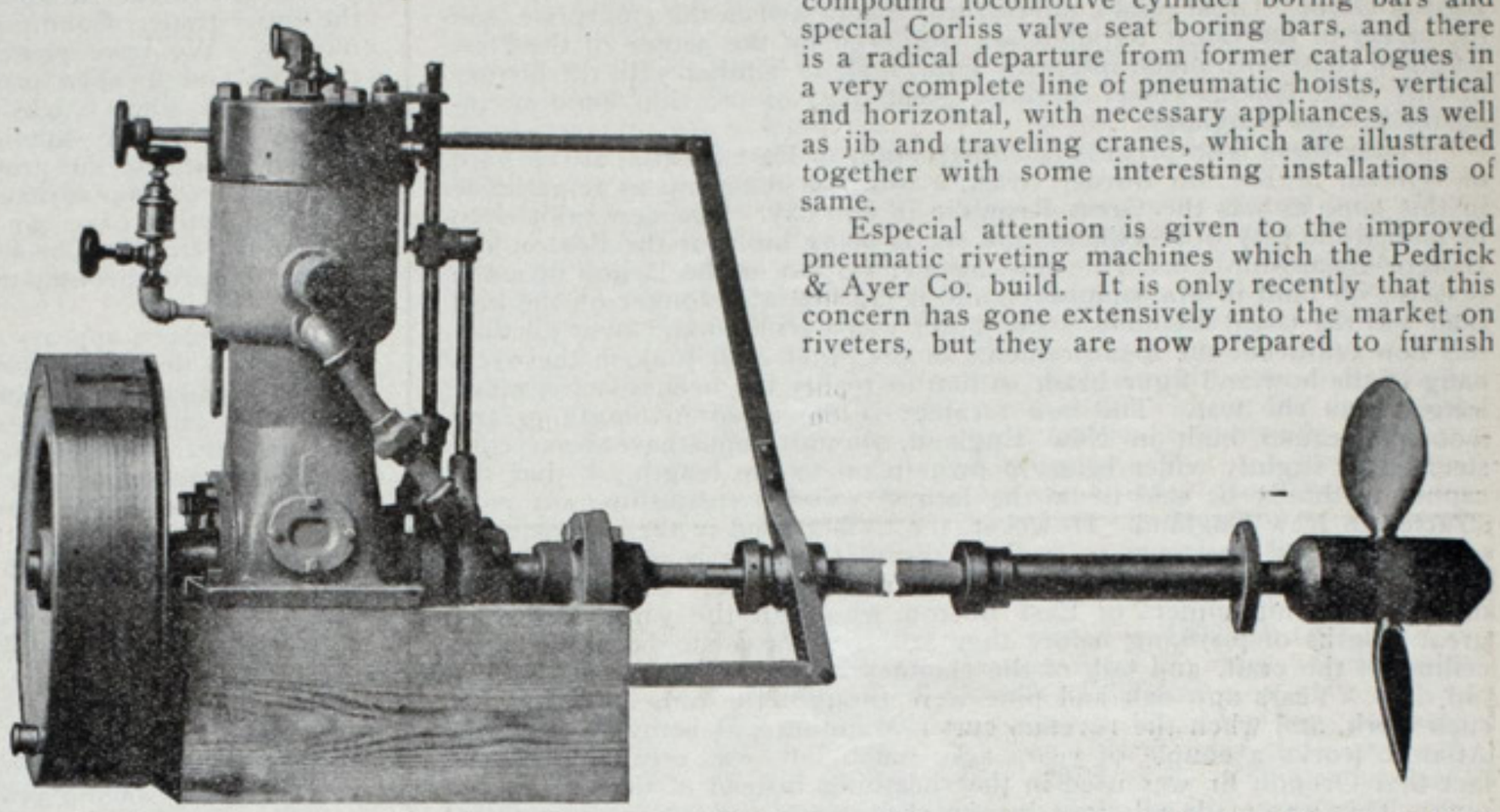
R. A. ALGER,
Secretary of War.

EXTENSIVE IMPROVEMENTS IN TRANSPORTS.

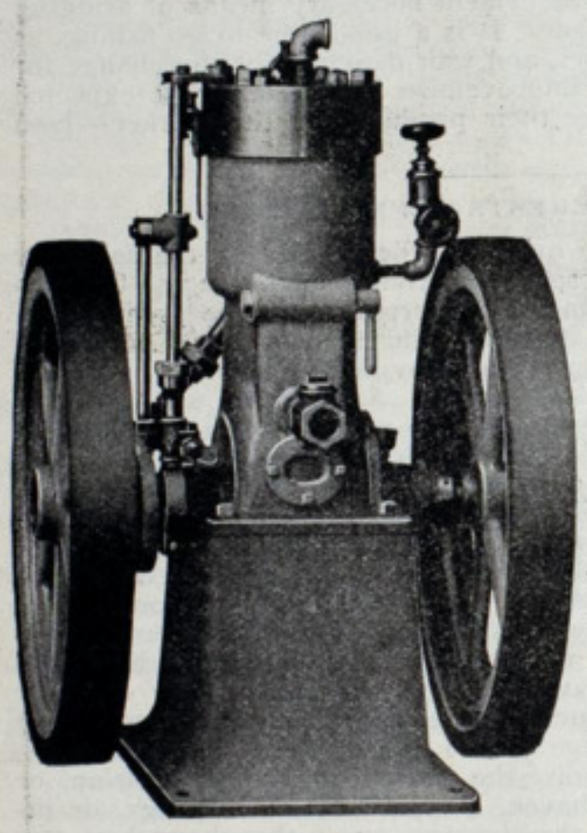
The steamers Buford and the Kilpatrick have been withdrawn from the army transport service between New York and West Indies for general reconstruction to fit them to ply between this country and the Philippines. They will be changed in interior arrangements so as to afford accommodations for 1,000 soldiers each. The contract for the work on the Buford has been awarded to the Newport News Shipbuilding & Dry Dock Co. at $397,000, the work to be completed in 125 days. The lowest bidder for work on the Kilpatrick was John N. Robins & Co. of Brooklyn, N. Y., who offered to do the work for $408,000. The contract will doubtless be awarded to that company.

GIDDINGS & STEVENS DESIGN OF MARINE ENGINES.

One of the illustrations presented herewith is a side elevation of the new two-cycle marine engine, with propeller shaft and reversing propeller complete, designed by Giddings & Stevens, mechanical engineers of Rockford, Ill. This firm has brought out different sizes of engines—1, 2, 2½, 4 and 6 H. P.—which are becoming deservedly popular and have been adopted by several engineers throughout the country. As will be noticed by reference to the second illustration—the same engine in stationary form on a square sub-base—the passage way from the crank case into which the engine compresses the mixture to the cylinder is cast as a part of the cylinder or frame casting, thereby doing away with a lot of unsightly pipes and fittings in making this connection. In this passage way will be noticed the taper plug valve, which is used as a throttling valve for stopping and starting, and for stationary uses is connected to a spring governor top, as shown in the cut, which will give a very steady and uniform motion for stationary work, throttling the amount of mixture delivered to the engine for each cycle or impulse, according to the demand of the load. The engine has its main shaft bearings packed against loss from leakage and is also furnished with an improved design of connecting rod, both end brasses of which may be taken up simultaneously through the hand-hole plate clearly shown in the cut. The piston serves as its own inlet and exhaust valve and the single eccentric shown in the cut operates the circulating water pump and also igniter, current for which is furnished by one of the magnetos supplied to the trade by Giddings & Stevens.



As will be seen by reference to the water outlet on top of the cylinder head, the latter is jacketed as well as the cylinder. It will be noticed also that the fly wheels are of ample proportion to give excellent regulation, and an additional driving pulley can be furnished if desired or belts taken directly from the fly wheels of each engine. The reversing propeller shown in the cut is one which Messrs. Giddings & Stevens have already perfected and brought out and which is included in the complete set of working drawings which they generally furnish to customers who adopt the design for manufacture to the trade. To such parties they are prepared to furnish complete sets of brass and iron castings of all parts required. A self-receding crank pin is shown in the rim of the fly wheel only partly drawn out. Altogether it will be noticed that this design is one of the simplest and neatest yet offered to the trade. Extreme simplicity of parts render it easy of manufacture in machine shop with ordinary equipment, and the very popular demand for these engines for boat and stationary uses has led several firms to take up their manufacture as a side line.



The designers of this engine report the recent completion of contracts for complete sets of working drawings as follows: Designs for a pair of heavy dredge boat engines to the Bucyrus Co. of Milwaukee; a five-drill compressor pump to the Union Iron Works of Spokane, Wash.; twelve sizes of standard Corliss engine drawings to a prominent eastern engine building firm; a Corliss cylinder and valve gear complete used on direct-connected ice machines for the Hutteman & Cramer Co. of Detroit; four sizes of standard four-cycle gas engine drawings to the Union Iron Works of Pittsburg; the same to the Union Iron Works of Memphis; seven sizes of gas engine drawings to the Braddock Machine & Manufacturing Co., Braddock, Pa.; six sizes to the Jno. Gillies Estate Co., Ltd., Carleton Place, Ontario; four sizes to the Blakeslee Co. of Birmingham, Ala., and four sizes of the two-cycle marine type to Fay, Bowen & Co. of Auburn, N. Y., J. C. Gehring of Port Huron, Mich., American Boat & Machine Co. of St. Louis, the Blakeslee Co. of Birmingham, Ala., Central Iron Works of Quincy, Ill., and Presque Isle Gas Engine Co. of Erie, Pa. Miscellaneous designs and drawings have been furnished to the following parties: Seaforth Engine Works, Seaforth, Ont.; Lexington Electric Machine Co., Lexington, Ky.; C. E. Lykke, Grand Island, Neb.; Monroeville Machinery Co., Monroeville, Ind.; H. Bieder, Ashtabula, O.

SUMMER COURSE AT NAVAL WAR COLLEGE.

Capt. Stockton, U. S. N., president of the naval war college at Newport, who is in Washington attending the meeting of the campaign board of the navy, had a conference this week with Assistant Secretary of the Navy Hackett and Adjutant General Corbin of the army, in regard to the assignment of army officers for the summer course of instruction at the college. Arrangements were made to assign to the naval war college five officers on duty at West Point. They are Col. Davis, judge advocate; Lieut.-Col. Bellinger, quartermaster; Major Knight, engineer corps, and Lieuts. Chamberlin and Davis of the line. It was arranged also that other officers of the army would go to Newport whenever they could get the opportunity to deliver lectures on military topics or to observe the workings of the course of instruction.

AN ATTRACTIVE TOOL CATALOGUE.

The Pedrick & Ayer Co. has just issued a new catalogue of 126 pages, illustrating the standard special railroad appliances of which they have been noted makers for many years. Some new tools are shown in their compound locomotive cylinder boring bars and special Corliss valve seat boring bars, and there is a radical departure from former catalogues in a very complete line of pneumatic hoists, vertical and horizontal, with necessary appliances, as well as jib and traveling cranes, which are illustrated together with some interesting installations of same.

Especial attention is given to the improved pneumatic riveting machines which the Pedrick & Ayer Co. build. It is only recently that this concern has gone extensively into the market on riveters, but they are now prepared to furnish them of any special design of frame, from portable machines for light work up to the heaviest stationary riveters for large boiler work, and cover a line of structural designs, including hinged riveters for intercostal work on vessels, where it is next to impossible to get at the rivets to drive them by hand.

A decided change in the ratings of the company's machines is noticed in the new catalogue which gives the total effective pressure exerted on a rivet, with various sizes of standard frames, ranging from 43,000 pounds to 188,000 pounds exerted pressure on the rivet, also the length of the final effective stroke which carries this maximum pressure. Whether the rivet be 2½ inches or 8 inches, the construction of the machine takes up the difference instantly, without any adjustment, and then admits of so much effective stroke. In arriving at the effective pressure desirable for a given size rivet, the Pedrick & Ayer Co. state that it is the practice of the best concerns to make a distinction of 20 per cent. less pressure on rivets for structural work than for steam-tight work. Every engineer, therefore, in selecting a riveter, should determine whether he wants to control a shearing strain only as is customary on structural work, or whether the machine must possess not only the shearing strain but the binding strain to make the work steam-tight. Copies of the catalogue, we are informed, may be obtained free upon application at the sole selling offices of the company, 85-87-89 Liberty street, New York.

AUTOMATIC RELEASING HOOKS HIGHLY PRAISED.

An article in the Review of June 10 described a unique and valuable publication—"Standard Boats of the United States Navy"—compiled under the direction of Rear Admiral Hichborn, chief of the bureau of construction and repair. Boats of the United States navy have been thoroughly standardized after the utilization of the highest science in their construction, supplemented by the practical experience of our naval captains and of the sailors who pull the oars. The book was published so as to provide information that would enable any boat builder to construct United States naval boats if they were needed in great numbers in time of war. They are now built in the navy yards. It is certainly a great compliment to the Standard Automatic Releasing Hook Co. of New York that a full page illustration in this work should be devoted to showing in every detail the standard hook as attached to a boat. To meet the approval of the navy department a device of this kind must be practical and must undergo severe tests.

Even with the best of life-saving devices ship owners are often sceptical. They cannot always be blamed, however, as the government is sometimes used in adopting regulations regarding shipping to force worthless appliances upon the vessel owner. But the general use that is now made of the Standard company's hook by leading passenger lines, as well as on government vessels, is evidence of its merits. Capt. Ira E. Dole of the Old Dominion company's steamer Yorktown says: "Your hooks do just what you claim they will do. They are a great help in handling a boat safely and quickly and I will recommend them to the heads of our company." Capt. Geo. H. Goddard of the United States light-house tender Cactus says: "Your device works to perfection and is all that can be desired for the purpose for which it is intended. It is certainly a most important item of equipment and should be adopted on all vessels." Capt. H. C. Doggett of the steamer City of Augusta, New York, says: "The hooks fitted to life boats on the steamship City of Augusta I have tested in port and at sea. When I took off the passengers from the burning steamship Leona, I found them to work to my entire satisfaction and recommend them to all shipmasters and others."

A steamer of 440 feet length and of about 6,000 gross tons capacity for the Wilson fleet of Cleveland was ordered from the Jenks Ship Building Co. of Port Huron shortly before the death of Capt. Thomas Wilson. This vessel is to be the largest and most costly in the Wilson Line. It is fitting that she should be named Capt. Thomas Wilson. A steamer of the Rockefeller fleet bears the name of Thomas Wilson, but it is hoped that this may be changed.

BACK NUMBERS OF THE REVIEW.—Liberal subscription extensions will be made by the Marine Review for issues of Jan. 21, 28 or Feb. 4, 1897, or July 21, 1898.

TRADE NOTES.

The Pittsburg Testing Laboratory, Ltd., now maintains offices at 325 Water street, Pittsburg; 906-7 Crozier building, Philadelphia; 60 New street, New York City; 1750 Monadnock block, Chicago, and 1107½ E. Main street, Richmond, Va.

A report from the Falls Hollow Staybolt Co., Cuyahoga Falls, O., is to the effect that orders from leading marine boiler manufacturers for hollow and solid staybolt iron continue brisk as ever, which is evidence that this material is very much appreciated.

The Philadelphia Pneumatic Tool Co. reports a rapidly increasing demand for their tools. Their chipping and calking hammers seem to be particularly in demand, large orders having recently been received from the Pennsylvania Steel Co., Baldwin Locomotive Works, Brown & Sharpe Mfg. Co., Ingersol-Sergeant Drill Co., the Bigelow Co., and many other representative concerns. This company has been obliged to more than double the capacity of its shops since the first of January. They have established agencies in all the leading cities of Europe and also in Japan.

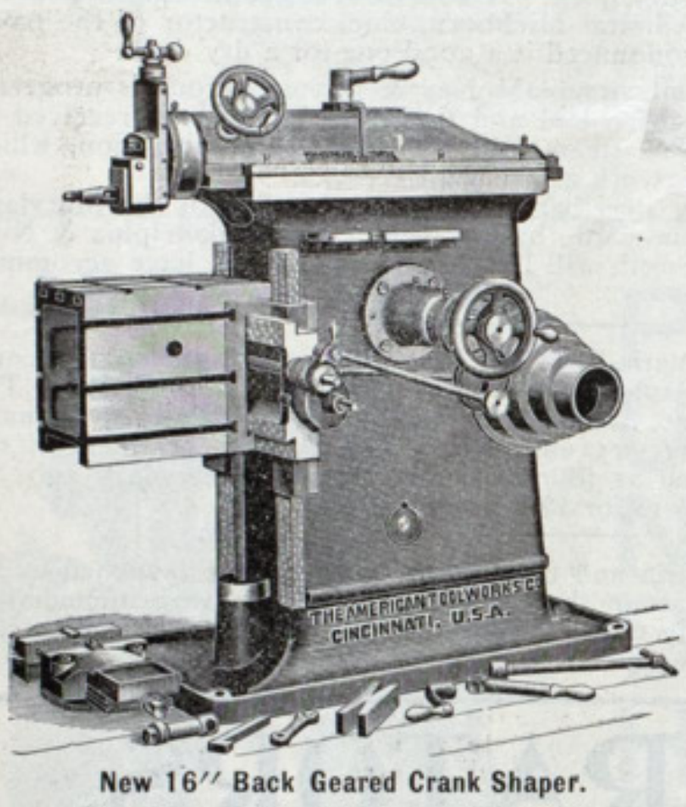
Commenting on the order which the Chicago Pneumatic Tool Co. received to supply Russian navy yards with pneumatic tools, the Implement & Machinery Review, a foreign publication, says: "British machine tool makers will be disposed to inquire why it is that the Chicago company has secured an order for 1000 pneumatic tools for the Russian yards, said to represent a value of about £60,000." The Implement & Machinery Review does not seem to be aware of the fact that 98 per cent. of all the pneumatic tools used in Europe are products of the Chicago company's factories, although they may be sold by large foreign houses who handle these tools.

The Nickel Plate road will sell low rate excursion tickets to North Manchester, Ind., account annual meeting of German Baptists (Dunkards) at one fare for the round trip. Tickets good going on May 29 to June 4 inclusive, beyond a radius of 100 miles, and on May 31 to June 8 within a radius of 100 miles from North Manchester, Ind. Good returning until June 10, or by deposit until July 5 inclusive. Call on or address E. A. Akers, C. P. & T. A., Cleveland, O., or C. A. Asterlin, T. P. A., Ft. Wayne, Ind. 67 June 4.

FOR SALE.

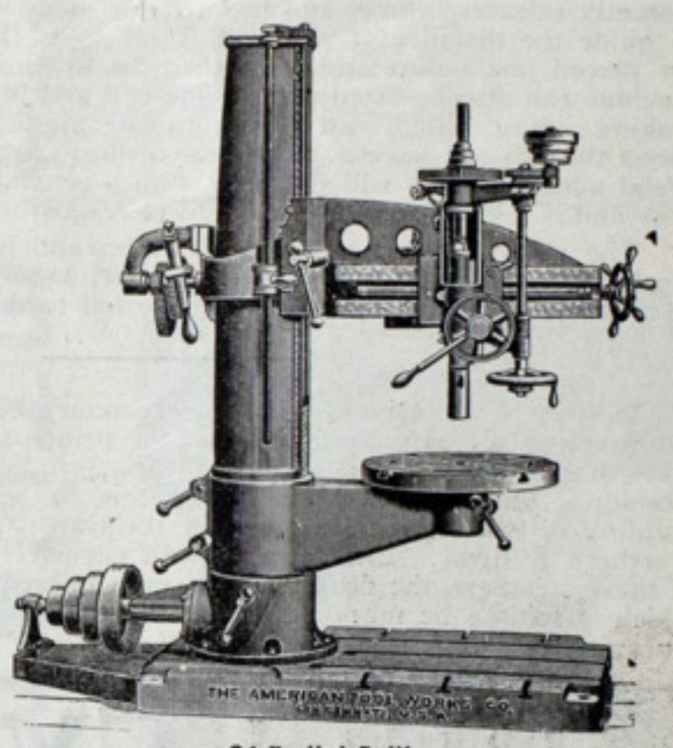
TUG HENRY—Wood hull, 60 feet long, 15 feet beam. Single engine, 16 by 18 inches. Boiler 10½ feet long, 78 inches diameter. Inquire C. H. Strong & Son, No. 623 Cuyahoga Building, Cleveland, Ohio. June 7.

Machine Tools



New 16″ Back Geared Crank Shaper.

LATHES, PLANERS, SHAPERS,
BORING and TURNING MILLS,
UPRIGHT and RADIAL DRILLS,
SCREW MACHINES,
PULLEY LATHES,
BOLT CUTTERS, Etc.



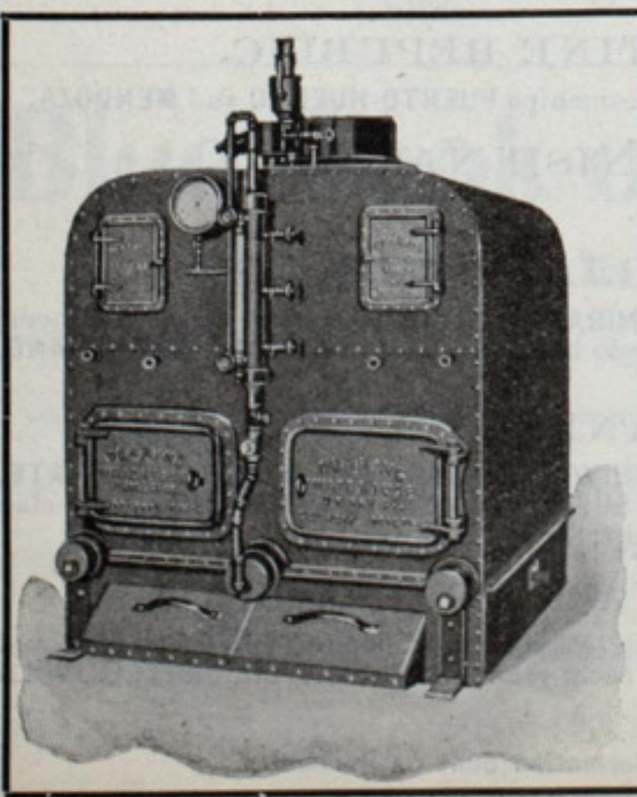
3′ Radial Drill.

The American Tool Works Co.,

BUILDERS OF COMPLETE LINES OF MACHINE TOOLS,

WORKS: CINCINNATI, U. S. A.

NEW YORK OFFICE: 120 Broadway, Geo. Place, Agent.
NEW ORLEANS: The Fairbanks Co.
CHICAGO STORE: 68-70 South Canal Street.
PHILADELPHIA: The Fairbanks Co.
CLEVELAND: The Strong, Carlisle & Hammond Co.
BOSTON STORE: 36 Federal Street.
BALTIMORE: The Fairbanks Co.
SAN FRANCISCO: Henshaw, Bulkley & Co.
DENVER AND SALT LAKE CITY: The Mine & Smelter Supply Co.
LONDON: Alfred Herbert, Ltd., 7 Leonard St., Finsbury, E. C.
DÜSSELDORF: de Fries & Co., Act. Ges., Graf Adolf Strasse, 83-87
ANTWERP: Nyssens Freres, 33 Rue des Peignes.
BERLIN: de Fries & Co., Act. Ges., Kloster Strasse, 13-15.
PARIS: Roux Fréres & Cie., 54 Boulevard du Temple.
MOSCOW: Alfred Stucken.



Steady Water Line.

Many water tube boilers make steam fast enough but cause trouble by foaming under forced draft to such an extent as to render the water gauge of very little use as an indicator of the amount of water in the boiler.

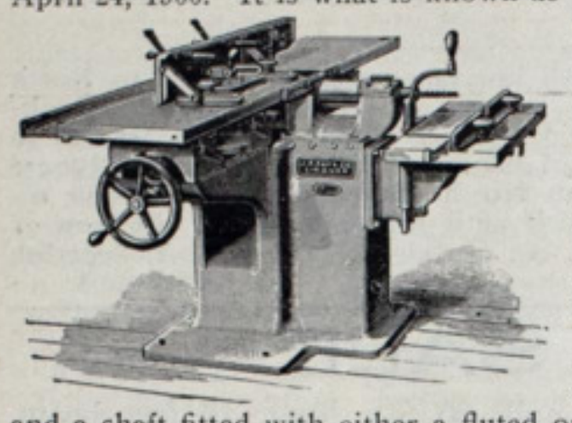
The Dearing Water Tube Boiler

Carries a steady water line either with natural or forced draft and delivers dry steam under all circumstances. They are quick steamers and have the maximum of capacity in the minimum of space and weight. Our catalogue has testimonials which will interest you.

Dearing Water Tube Boiler Co., **Detroit, Mich.**

POWERFUL SELF-FEED RIPPING SAW.

We illustrate a new ripping saw just placed on the market by J. A. Fay & Co. of 150 to 170 West Front street, Cincinnati, and patented April 24, 1900. It is what is known as the Fay company's large self-feed ripping saw. This machine is very powerful and has been specially designed for ripping material into parallel strips in large establishments where heavy work is done, such as ship yards, car, railroad and locomotive shops, saw and planing mills, carriage, wagon and wheel shops, furniture, chair and piano factories.



The feed is exceptionally strong and consists of a feed shaft and toothed disk for feeding and a shaft fitted with either a fluted or smooth roll for discharging the material, and is so arranged that the entire mechanism can be lifted out of the way if desired to use the machine as a hand rip saw. The table is of ample size and made either of iron or hardwood, with a detachable section around the saw, so that heads for graining, rabbetting, etc., or a series of saws for ripping several pieces at one time can be used. The fence is long and has a movement across the table by hand lever which instantly releases, moves and locks it, or vice-versa, and it has an index to guide the distance at which it is set from the saw. Friction rollers are placed just before and after the saw to diminish the friction. This machine can also be fitted with a side roll and bevel fence attachment for making siding, which can be set to any angle and any thickness, and shops that do not have a great deal of heavy work will find this a most useful addition, as it will do away with a separate machine for this purpose and is a good acquisition for light re-sawing.

The manufacturers will furnish prices and full particulars to intending buyers, and will forward their new 394-page illustrated catalogue free to manufacturers and foremen, if requested to do so.

Gilbert N. McMillan, who was secretary of the Detroit Dry Dock Co. previous to the consolidation of the principal ship yards of the great lakes, has become associated with the Eastern Ship Building Co. of New London, Conn., the organization that is to begin operations with the building of two freight steamers for the transpacific service of the Great Northern Railway. Enormous freight capacity will be a special feature of these steamers, the deck room of each exceeding a space of five acres, which is said to be more than equal to the combined deck space of the Lucania and Campania.

REPORTS FROM THE SHIP YARDS.

Workmen at the yards of the Harlan & Hollingsworth Co., Wilmington, Del., last week completed the cutting apart of the steamer Indiana for the Boston line for the purpose of lengthening her 40 feet. The additional keel piece which will be inserted will be placed in position soon and the work of restoring the vessel will be pushed. It is expected that she will be completed in thirty days. The Indiana was built by the Harlan & Hollingsworth Co. in 1890 for the Windsor line. She was 227 feet in length, 38 feet moulded beam and 26 feet depth of hold.

Crawford & Reid, Tacoma, Wash., are at present building a large number of scows for the Tacoma trade. They are to be used for lightering the cargo of ships at Cape Nome. There are no wharfage facilities at the Nome, which makes the business of lightering a serious one. Crawford & Reid now have the steamer Mainlander on the ways and the ship is beginning to assume shape. She is well modeled, being 163 feet long and 28 feet beam. She is being built for Cook & Co., for the Vancouver line.

The Commercial Steamship Co., Providence, R. I., has been formed to build and purchase steamboats. The capital stock is $200,000 and the incorporators are E. S. Aldrich, F. M. Mathewson, J. P. Farnsworth, H. K. Blanchard, W. W. Whipple, E. Wise, all of Providence; F. W. Tillinhast of Johnston; J. S. Carpenter, attorney, Providence.

The California Dry Dock Co. is to build at Hunter's point, San Francisco, an immense dry dock. It will be 750 feet in length and 120 feet in breadth. Rear Admiral Hichborn, chief constructor of the navy, inspected the site and pronounced it a good one for a dry dock.

The ship building industry of McKay & Dix at Verona is progressing. Nine frames have been laid and timber is being daily received to complete the vessels. The steam mill will soon be in operation, which will greatly facilitate the work at the yard.

An order for a new steel barge has been placed with the Maryland Steel Co., Sparrow's Point, Md., by the New York, Philadelphia & Norfolk Railway Co. Its length will be 360 feet and it will have accommodation for thirty cars.

The Chicago Pneumatic Tool Co. has just made shipment of a complete compressed air plant for the Kawasaki dock yards, Japan. The shipment includes a large electrical-driven air compressor, pneumatic hammers, drills, shell riveters, etc. Mr. J. W. Duntley, president of the Chicago company cabled as follows from Europe, a few days ago: "I have to report fresh orders for 1000 tools."

The battleship Pobeda and the cruiser Aurora were launched at St. Petersburg on Friday last in the presence of the czar, who immediately after witnessed the laying down of two more warships, the Borodino and the Alexander III.

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COMPAGNIE DES CHEMINS DE FER DE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS, CAEN, BREST, CHERBOURG**; Fast Steamers **TAMISE, MANCHE, FRANCE**.

RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **SVETLANA**; Cruiser **DIANA**; Cruiser **PULLADA**; Torpedo Transport Boat **BAKAN**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**; Iron Clad **SINOPE**.

ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR, ARROGANT, FURIOUS, VINDICTIVE**, cruisers; **NIOBE, DIADEM, ANDROMEDA, EUROPA**, cruisers; **CANOPUS, GLORY, GOLIATH, ALBION, OCEAN**, iron clad ships; **ARGONAUT, ARIADNE, AMPHITRITE, SPARTIATE, HERMES, HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY, ABOUKIR, SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE, FORMIDABLE** and **IRRESISTIBLE, VENERABLE, LONDON, BULWARK**, iron clad ships; **EURYALUS, BACHANTE**, cruisers; **MUTINE, RINALDO, SHEARWATER**, sloops; **CORNWALLIS, DUNCAN, EXMOUTH, RUSSEL**, iron clad ships; **DRAKE, KING ALFRED, LEVIATHAN, AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX, KENT**, cruisers; **ALBEMARLE, MONTAGUE**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

AUSTRIAN NAVY.

BUDA-PEST, iron clad coast guard; **KAISER KARL VI**, cruiser; **X', X'''**, battleships.

ITALIAN NAVY.

VARESE, cruiser; **BENEDETTO BRIN**, battleship.

ARGENTINE REPUBLIC.

PUEYRREDON, cruiser; Steamships **PUERTO-HUERGO** and **MENDOZA**.

SPANISH NAVY.

REINA REGENTE, cruiser.

CHILIAN NAVY.

O'HIGGINS, cruiser; **ALMIRATE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **GENERAL BAQUEDANO**, school ship.

JAPANESE NAVY.

SHIKISHIMA, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship; **TZUMO**, cruiser.

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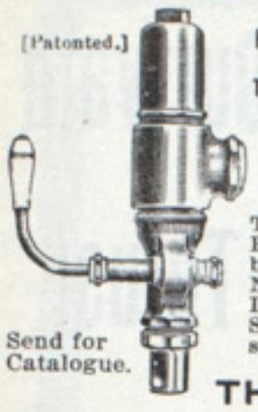

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Sealed proposals will be received at the Office of the Lighthouse Engineer, Fifth District, Postoffice Building, Baltimore, Md., until 12 o'clock, m., June 14, 1900, and then opened, for furnishing the materials and labor of all kinds necessary for the erection and delivery of the Hooper Island Lighthouse, Md., in accordance with plans and specifications, copies of which, with blank proposals and other information, may be had upon application to W. A. Jones, Lieutenant-Colonel, Corps of Engineers, U. S. A. June 21.

U. S. Engineer Office, Jones Building, Detroit, Mich., May 29, 1900. Sealed proposals for improving Detroit river—including dredging, removing boulders, and excavating bedrock—will be received here until 12 noon (Standard time), June 13, 1900, and then publicly opened. Information furnished on application. G. J. Lydecker, Lt. Col., Engrs. June 7.

U. S. Engineer Office, Vicksburg, Miss., May 28, 1900. Sealed proposals for excavating 7,500,000 cubic yards of earth, more or less, along route for diverting mouth of Yazoo River, near Vicksburg, Miss., will be received here until 3 o'clock, p. m., June 28, 1900, and then publicly opened. Information furnished on application. Thos. L. Casey, Major, Engrs. June 21.

U. S. Engineer Office, Galveston, Tex., May 30, 1900. Sealed bids in triplicate, for Improving Galveston Ship Channel and Buffalo Bayou, Tex., by dredging, etc., will be received until 2 p. m., June 30, 1900, and then publicly opened. For information apply to C. S. Riche, Capt., Engrs. June 21.

U. S. Engineer Office, Customhouse, Cincinnati, O., May 16, 1900. Sealed proposals for hire of one or more Dredging Plants, each consisting of one Dredge, one Towboat and Three Dump Scows, for use on Ohio River, will be received here until 2 p. m., June 15, 1900, and then publicly opened. Information furnished on application. Wm. H. Bixby, Maj., Engrs. June 7.

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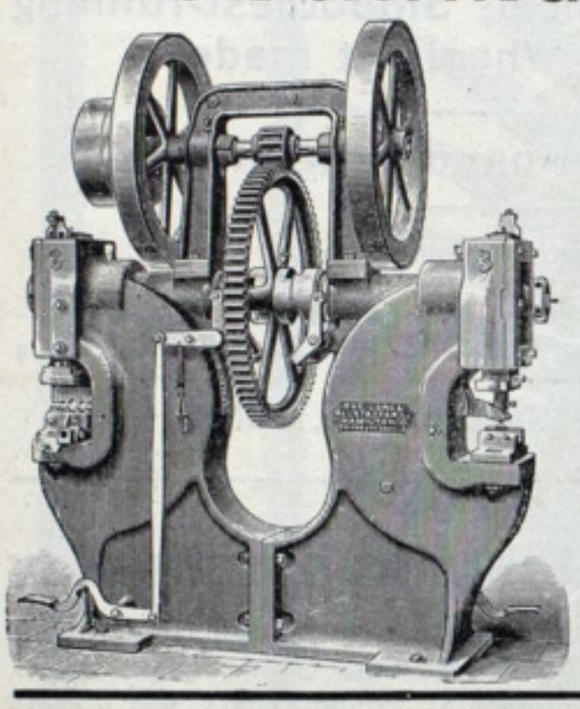

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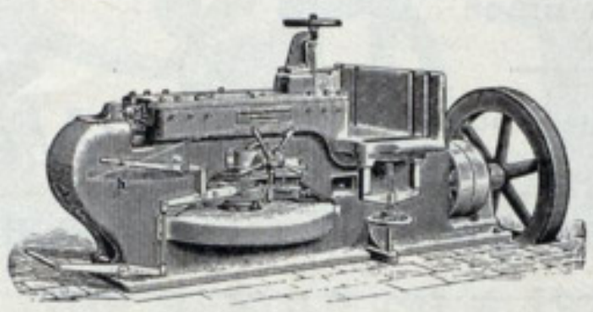

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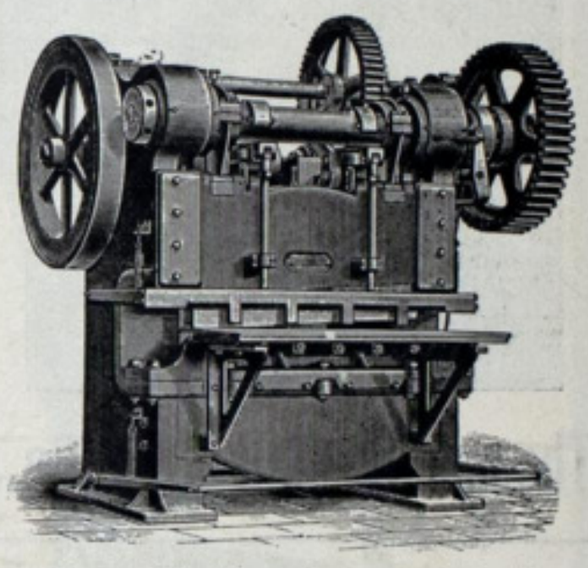

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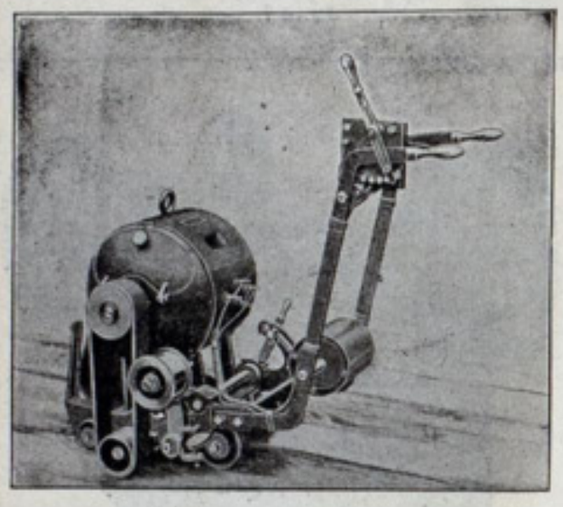

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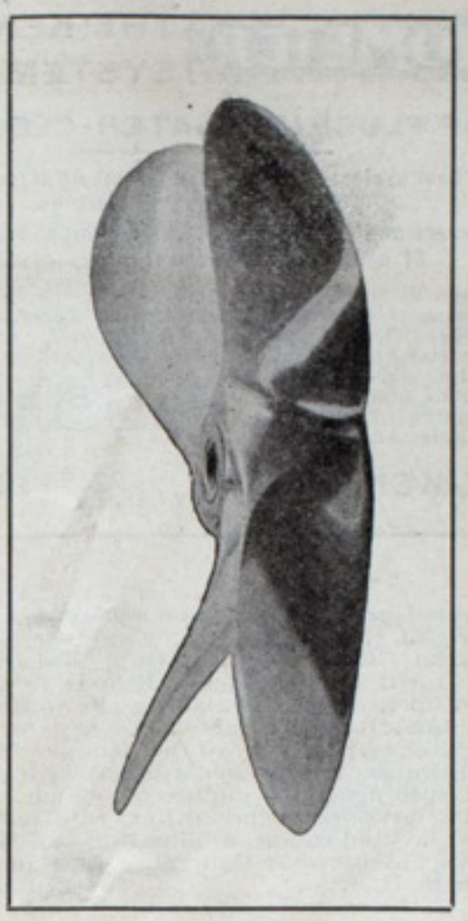

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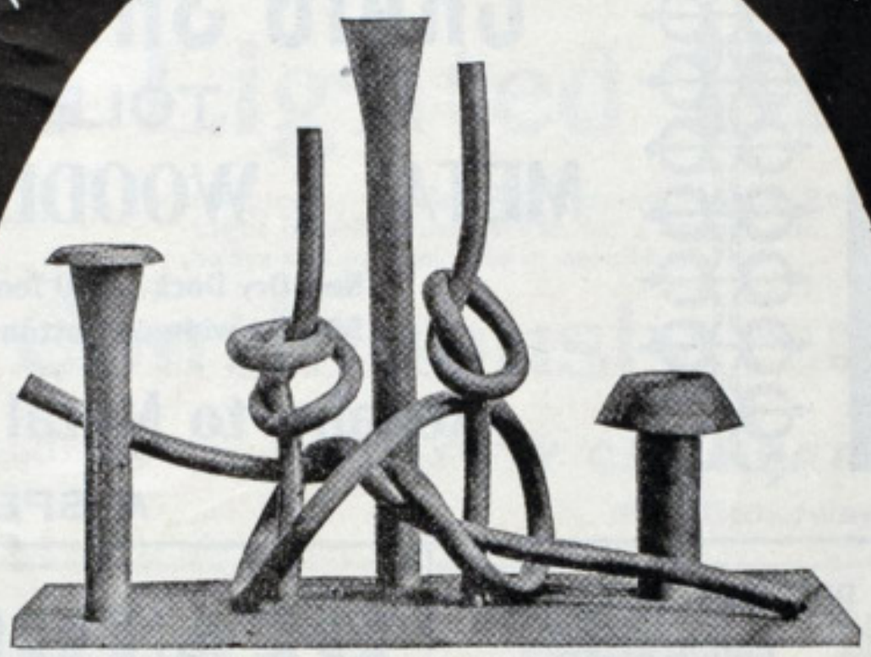

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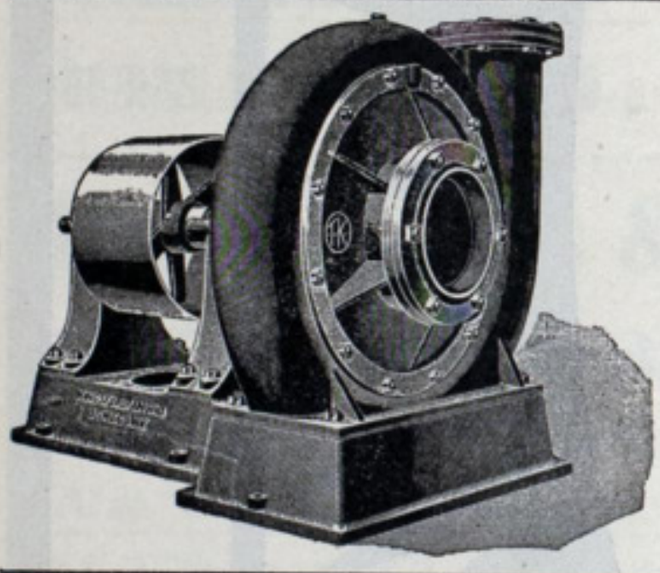

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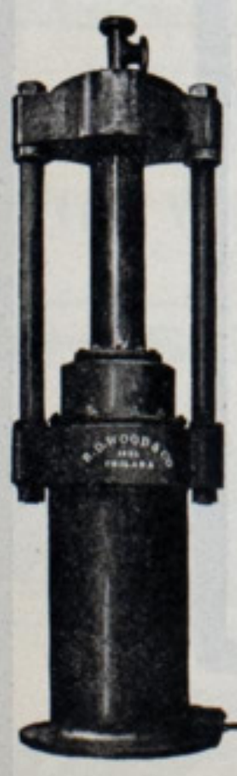

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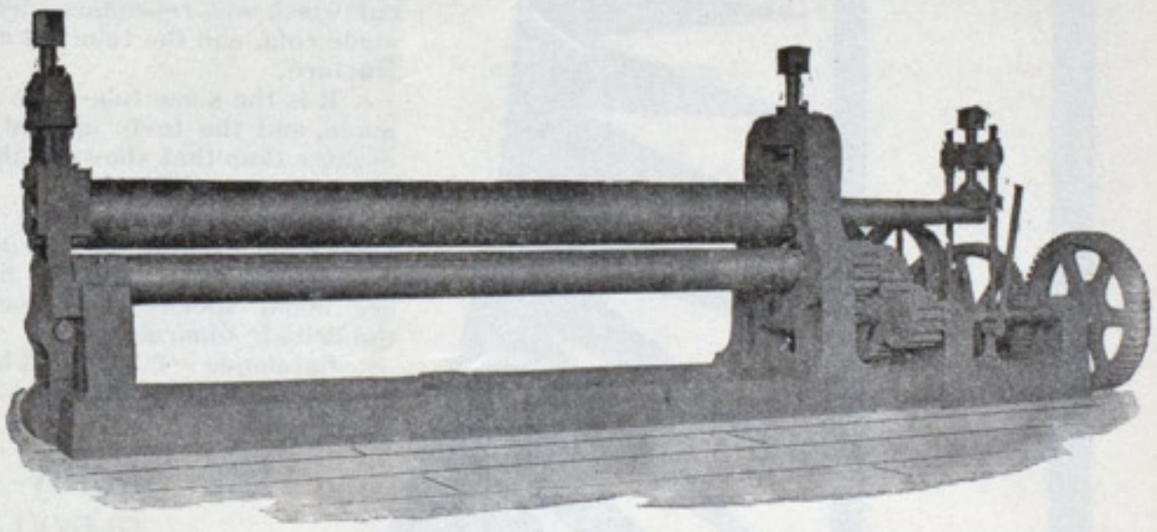

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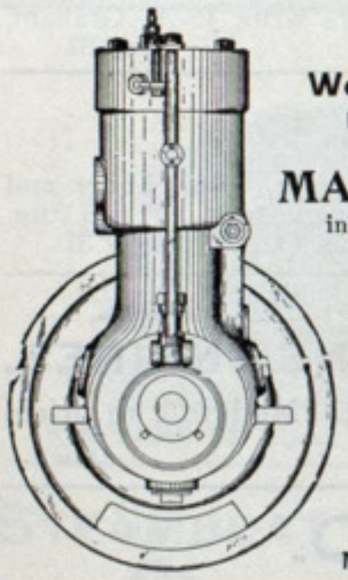

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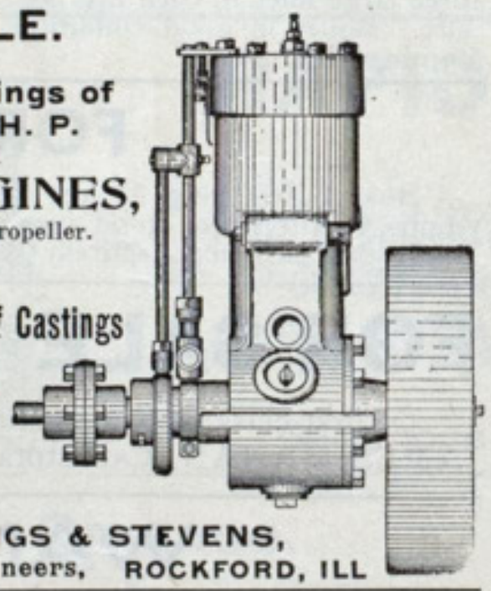

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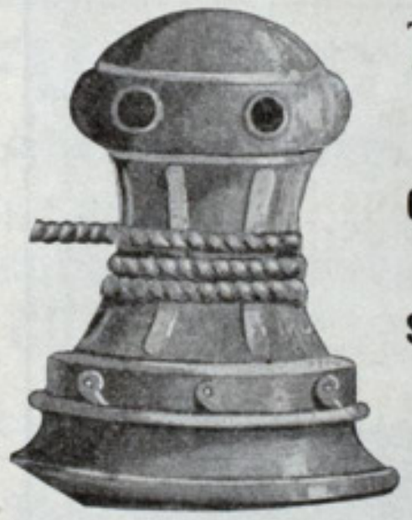

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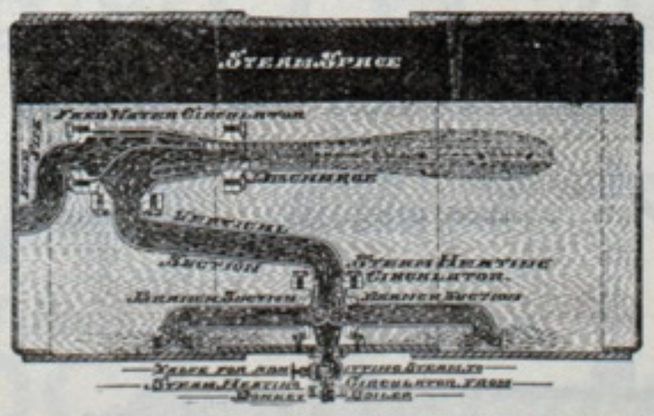

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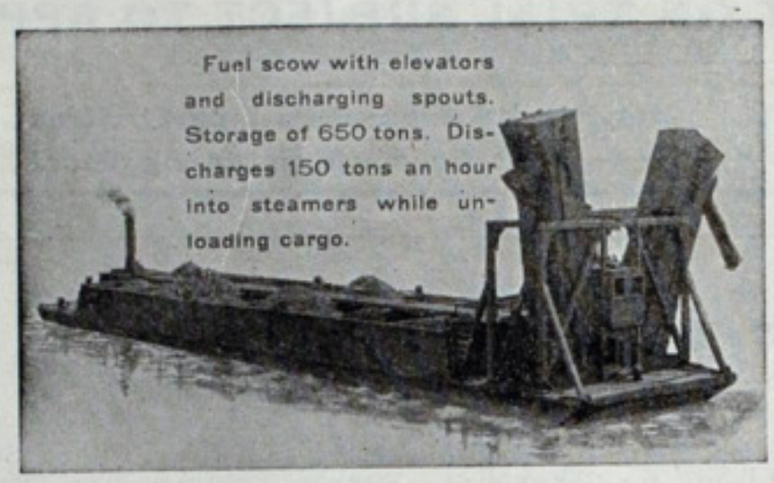

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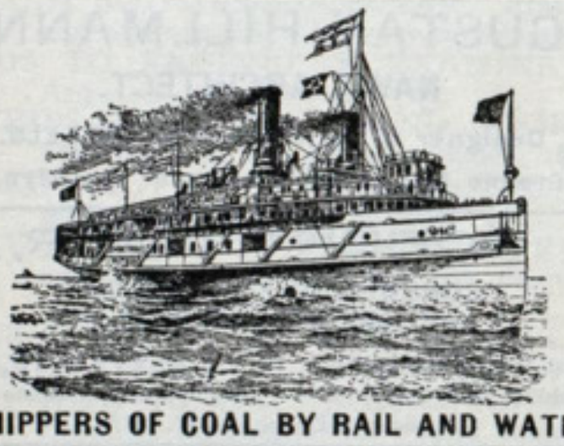

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Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

ANTI-FRICTION METALS.

Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd....Philadelphia.

ARTIFICIAL DRAFT FOR BOILERS.

American Ship Building Co.....Cleveland.
Bloomsburg & Co., H.....Newport News, Va.
Buffalo Forge Co.....Buffalo.
Detroit Shipbuilding Co.....Detroit.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

ATTORNEYS AND PROCTORS IN ADMIRALTY.

Crowl, Samuel H.....Cleveland.
Gilchrist, Albert J.....Cleveland.
Goulder, Harvey D.....Cleveland.
Hoyt, Dustin & Kelley.....Cleveland.
Pinney, Orestes C.....Cleveland.
White, Johnson, McCaslin & Cannon.....Cleveland.

AXLES, SOLID AND HOLLOW.

Bethlehem Steel Co.....So. Bethlehem, Pa.

BABBITT METAL.

Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd....Philadelphia.

BAROMETERS, MARINE GLASSES, ETC.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

BENDING AND STRAIGHTENING ROLLS.

Cleveland Punch & Shear Works Co.....Cleveland.
Long & Allstatter Co.....Hamilton, O.
New Doty Mfg. Co.....Janesville, Wis.

BLOCKS, SHEAVES, ETC.

Boston & Lockport Block Co.....Boston, Mass.
Cleveland Block Co.....Cleveland.
Donohue & Co., John T.....Baltimore.

BLOWERS.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

BOAT NAILS AND SPIKES.

American Steel & Wire Co.....Chicago.

BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....New York.
Lane & DeGroot.....Brooklyn.

BOILER MANUFACTURERS.

Almy Water Tube Boiler Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Babcock & Wilcox Co.....New York.
Bath Iron Works, Ltd.....Bath, Me.
Boyer Water Tube Boiler Co.....New York.
Chicago Ship Building Co.....Chicago.
Cramp, Wm. & Sons.....Philadelphia.
Dearing Water Tube Boiler Co.....Detroit.
Delaunay, Belleville & Co.....St. Denis, France.
Detroit Screw Works.....Detroit.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co.....Morris Heights, N. Y.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Kingsford Found'y & Machine Works.Oswego, N. Y.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roberts Safety Water Tube Boiler Co....New York.
Stirling, The Co.....Chicago.
Trigg, Wm. R. Co.....Richmord, Va.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

BOILER COMPOUND FEEDER.

Hall Compound Feeder Co.....Chicago.

BOILER TUBES, SEAMLESS, WELDLESS—Steel, Brass and Copper.

Atlantic Tube Co.....Pittsburg.
Hungerford Brass & Copper Co.....New York.
Shelby Steel Tube Co.....Cleveland.

BOILER FURNACES, FIRE FRONTS, ETC.

Continental Iron Works.....New York.

BOILER RIVETS.

Bourne Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BOLT CUTTERS.

American Tool Works Co. (The).....Cincinnati.

BORING AND TURNING MILLS.

American Tool Works Co. (The).....Cincinnati
Bement, Miles & Co.....Philadelphia.

BRASS AND BRONZE CASTINGS, SHEETS, RODS, ETC.

Cory, Chas. & Son.....New York.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.

BRIDGES, BUILDERS OF.

Berlin Iron Bridge Co.....East Berlin, Conn.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Mach. Co..Cleveland.
McMyler Mnfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

CHAINS.

Lebanon Chain Works.....Lebanon, Pa.
Monongahela Iron & Steel Co.....Pittsburg.
Standard Chain Co.....Pittsburg.

CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.

CHUCKING MACHINES.

American Tool Works Co. (The).....Cincinnati.

CIRCULATOR EQUILIBRIUM, with Steam Heating Attachment.

Bloomsburg & Co., H.....Newport News, Va.

CLOCKS (Marine), CHRONOMETERS, BELLS.

Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Chelsea Clock Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt.....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co....Buffalo.
Scott Co., W. L.....Erie, Pa.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS ADJUSTER.

Simpson, Geo. A.....Sault Ste. Marie, Mich.

COPPER AND SHEET IRON WORK.

Pusey & Jones Co.....Wilmington, Del.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

CRANES, CONVEYORS, HOISTS.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Donohue & Co., John T.....Baltimore.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

CRANK PINS.

Bethlehem Steel Co.....Bethlehem, So. Pa.

DECK PLANING MACHINERY.

Dallett, Thos. H. & Co.....Philadelphia.

DECK SEAMS, COMPOSITION FOR.

Cole & Kuhls.....Brooklyn, N. Y.

DRILLS—ROCK DRILLS, COAL CUTTERS, ETC.

Ingersoll-Sergeant Drill Co.....New York.

DRILL PRESSES—DRILLS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.

DRILLS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

DRYING APPARATUS.

Sturtevant Co., B. F.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Newport News Ship Bldg Co....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Townsend & Downey Ship Bldg. Co....New York.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.

ELEVATORS.

Morse, Williams & Co.....Philadelphia.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Sprague Electric Co.....New York.
Sturtevant, B. F Co.....Boston.
Westinghouse Electric & Mnfg. Co..Pittsburgh, Pa.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co., and Chas. L. Seabury & Co., Consolidated.....New York.
Giddings & Stevens.....Rockford, Ill.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co..Philadelphia.
Newport News Ship Bldg Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Giddings & Stevens.....Rockford, Ill.
Hillman, Gustav.....Brooklyn.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Simpson, W. L.....5th and Buttonwood, Philadelphia.
Wood, W. J.....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo
Warren Webster & Co.....Camden, N. J.
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.

FLUSHOMETERS.

Kenney, The Co.....New York.

FURNACES FOR BOILERS.

Continental Iron Works.....New York.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FUELING COMPANIES AND COAL DEALERS.

Castner, Curran & Bullitt (Pocahontas)..... Philadelphia.
Graham, James & Co.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co..Buffalo.
Smith, Stanley B. & Co.....Detroit.
Scott Co., W. L.....Erie, Pa.
Youghiogheny & Lehigh Coal Co.. .....Chicago.

GAS BUOYS.

Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.

Giddings & Stevens.....Rockford, Ill.
McMyler Mnfg. Co..... .....Cleveland.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.

Dixon Crucible Co., Joseph... ....Jersey City, N. J.

HAMMERS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, POWER DROP.

Bement, Miles & Co.....Philadelphia.
Chase Machine Co.....Cleveland.

HAWSERS, WIRE.

American Steel & Wire Co.....Chicago.

HEATING APPARATUS.

Sturtevant Co., B. F.....Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.
Brown Hoisting & Conveying Mach. Co..Cleveland.
Chase Machine Co.....Cleveland.
Donohue & Co., John T.....Baltimore.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co... .....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co..... .....Cleveland.
Marine Iron Co.....Bay City.
Sprague Electric Co..... .....New York.
Westinghouse Electric & Mnfg. Co.... ...Pittsburg.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.

Jenkins Bros.....New York.
Penberthy Injector Co.....Detroit.

INSURANCE, MARINE.

Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys..... .....Milwaukee.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn & Co., F. H..... .....Chicago.
Pauly, H. J.....Milwaukee.
Parker & Millen.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.

IRON ORE AND PIG IRON.

Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.

LAUNCHES—NAPHTHA, ELECTRIC.

Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.

LIFE BOATS—METALLIC.

Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.

Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.

Page Bros. & Co.....Boston.

LUBRICATING PUMPS.

Manzel Bros.....Buffalo.
Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

MACHINE TOOLS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.

MACHINE TOOLS (WOOD WORKING).

Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York.
Mechanical Fabric Co.....Providence, R. I.

METALLIC PACKING.

Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.

Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.

NAUTICAL INSTRUMENTS.

Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.

NAVAL ARCHITECTS.

Curr, Robert.....Cleveland.
Hillman, Gustav.....Brooklyn.
See, Horace.....New York.
Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.

Bethlehem Steel Co.....So. Bethlehem, Pa.

OILS AND LUBRICANTS.

Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.

Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.

Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.

Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.

Egan Co., The..... .....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A..... .....So. Boston.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.

PLANING MILL MACHINERY.

Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

PLUMBING, MARINE.

Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

PNEUMATIC TOOLS.

Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co..... .....Chicago.

POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Case, A. Wells & Son.....Highland Park, Conn.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co..... .....Weymouth, Mass
Hardy, John B..... .....Tacoma, Wash.
Hyde Windlass Co..... .....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

PROJECTORS, ELECTRIC.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co..... .....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Donohue & Co., John T.....Baltimore.
Kingsford Foundry & Machine Works..... .....Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.. ...Cleveland.
Long & Allstatter Co.....Cincinnati.
New Doty Mnfg. Co.....Janesville, Wis.
Wood & Co., R. D.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.

Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).

American Steel & Wire Co.....Chicago.

RUBBER INSULATED WIRES.

Roebling's Sons, John A..New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.

See wrecking companies.

SCREW MACHINES.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.

SEARCH LIGHTS.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).

Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

SHAPERS.

American Tool Works Co. (The).....Cincinnati.

SHEARS.

See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co... ..New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.
Marine Supply Co..... .....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

SLING FRAME FOR HANDLING BARRELS.

Patriarche, H. R.....Milwaukee.

SPARS—LARGE SIZES.

Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.

Holmes, Samuel.....New York.

STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.
Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Donohue & Co., John T.....Baltimore.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee

STOKERS FOR MARINE SERVICE.
American Stoker Co.....New York.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.
Berlin Iron Bridge Co.....East Berlin, Conn.

SURVEYORS, MARINE.
Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THRUST COLLARS FOR PROPELLER SHAFTS.
Ball Bearing Co.....Boston, Mass.

TIMBER—LARGE PIECES.
Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
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Cleveland Punch & Shear Works Co. ...Cleveland.
Long & Allstatter, The Co.....Hamilton, O.
New Doty Mnfg. Co.....Janesville, Wis.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

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Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

TRUCKS.
Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING, STEEL, COPPER AND BRASS.
Atlantic Tube Co.....Pittsburg.
Hungerford Brass & Copper Co., U. T...New York.
Merchant & Co., Inc.....Philadelphia.
Shelby Steel Tube Co.....Cleveland.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.
Smith, Edward & Co.....New York.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Bull & Co, A. H.....New York.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

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Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant Co., B. F.....Boston.

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American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

WORM GEARING.
Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

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YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.

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Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Chelsea Clock Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

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Lane & DeGroot.....Brooklyn.

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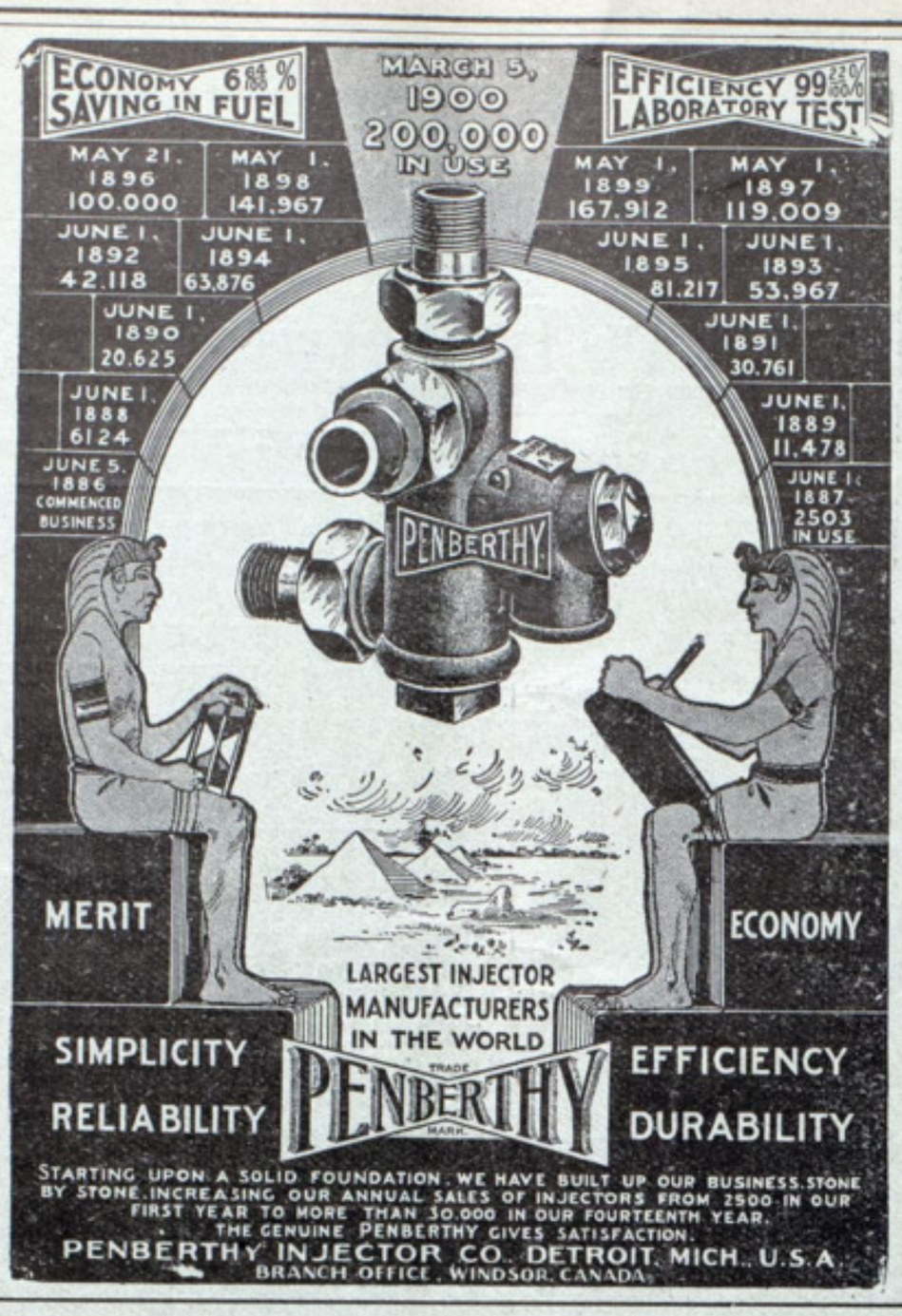

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No. 126, Norwalk Accommodation	†7 55 am	.....
No. 40, Toledo & Buffalo Accom., via Norwalk.	†10 00 am	†10 30 am
No. 126, Norwalk Accommodation	†7 55 am	.....
No. 116, Conneaut Accommodation	.....	†4 30 pm

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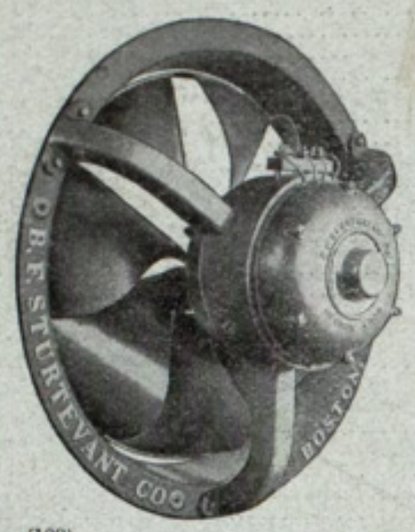

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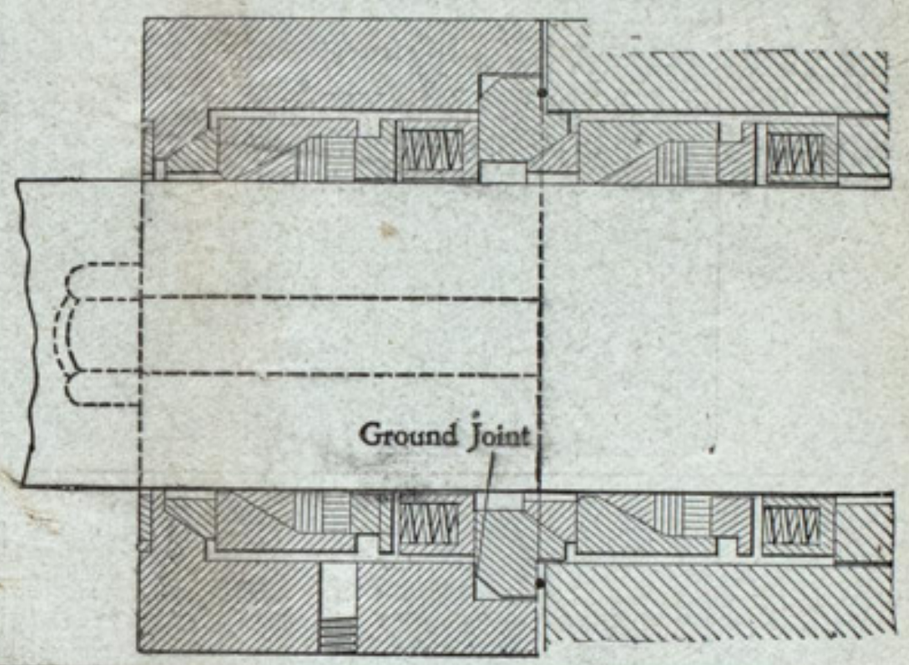

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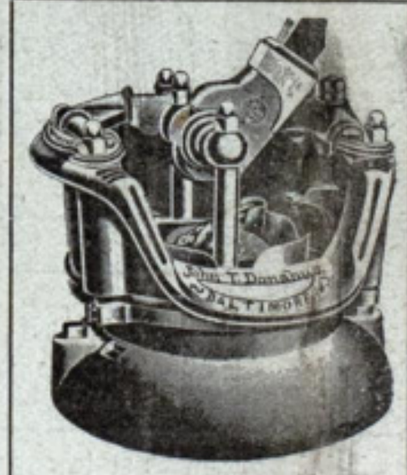

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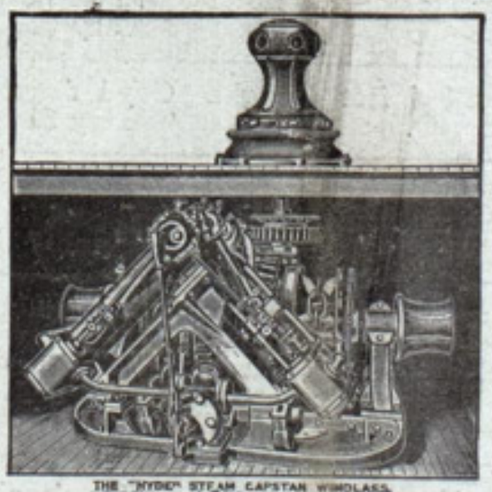

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MARINE REVIEW

VOL. XXI. CLEVELAND, O., MAY 31, 1900. No. 22.

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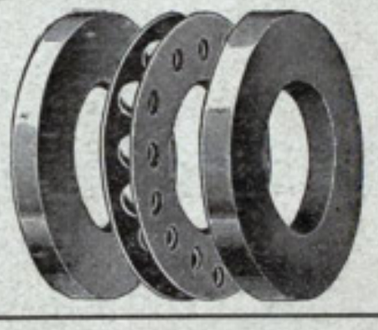

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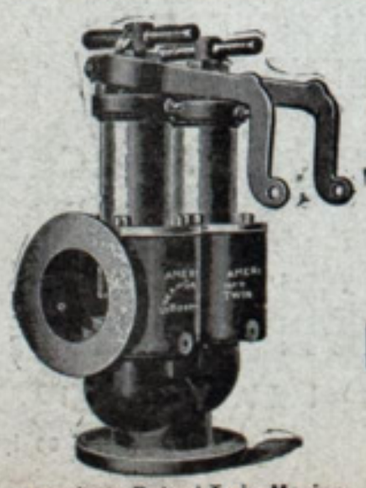

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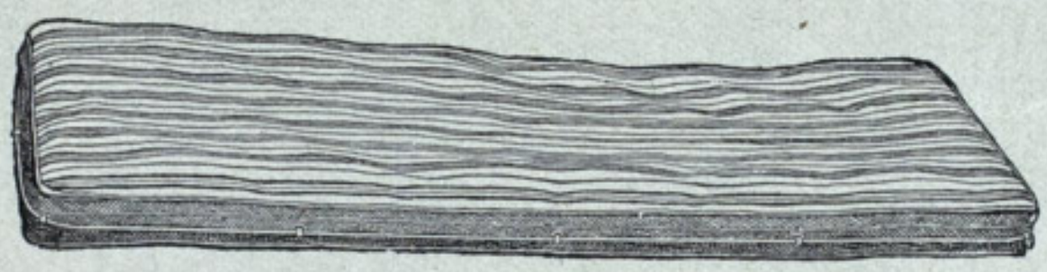

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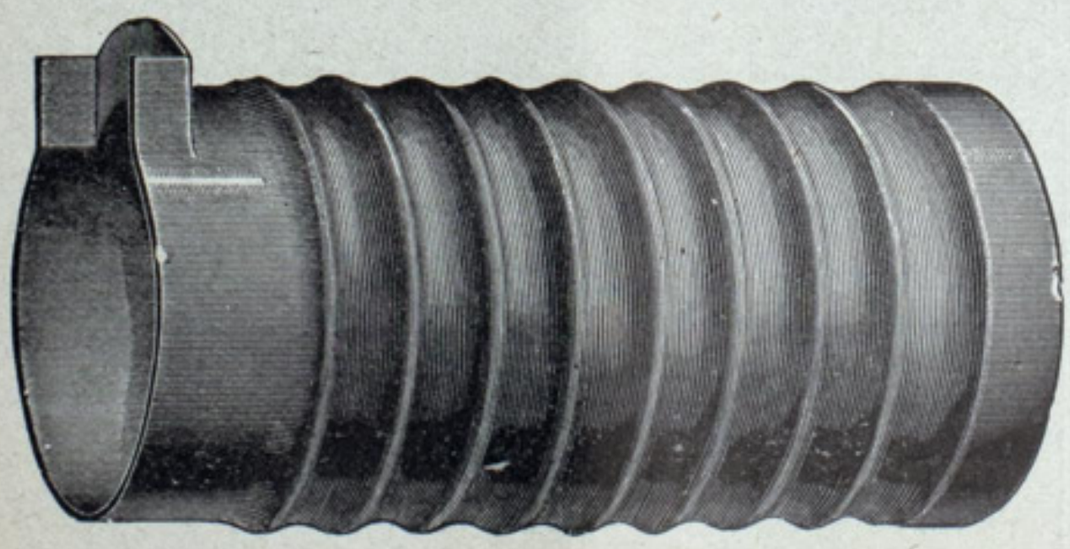

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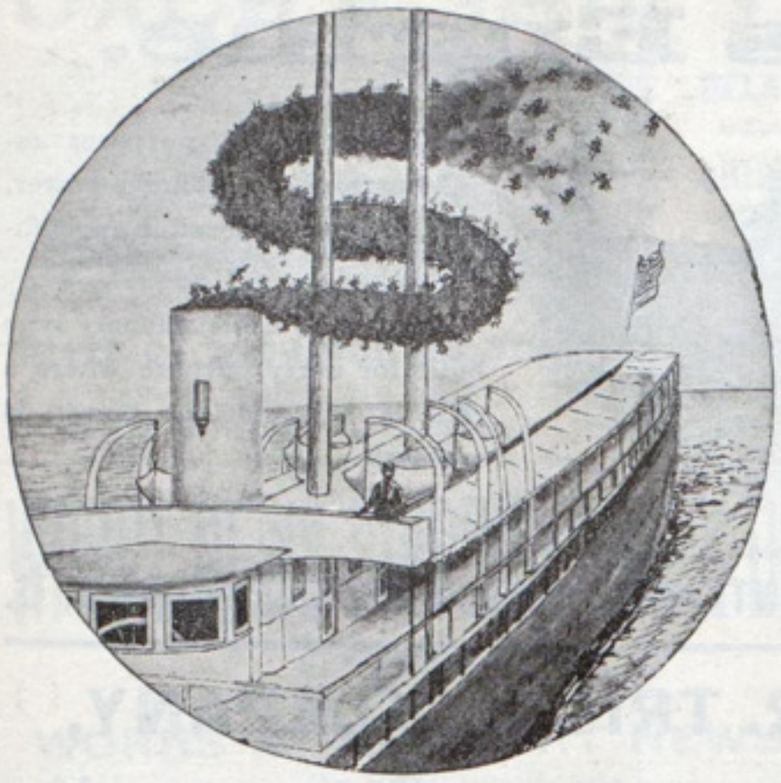

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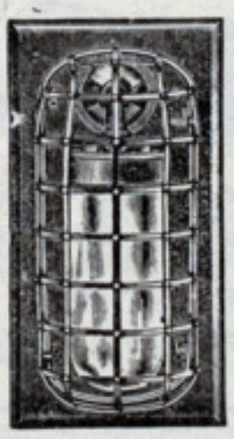

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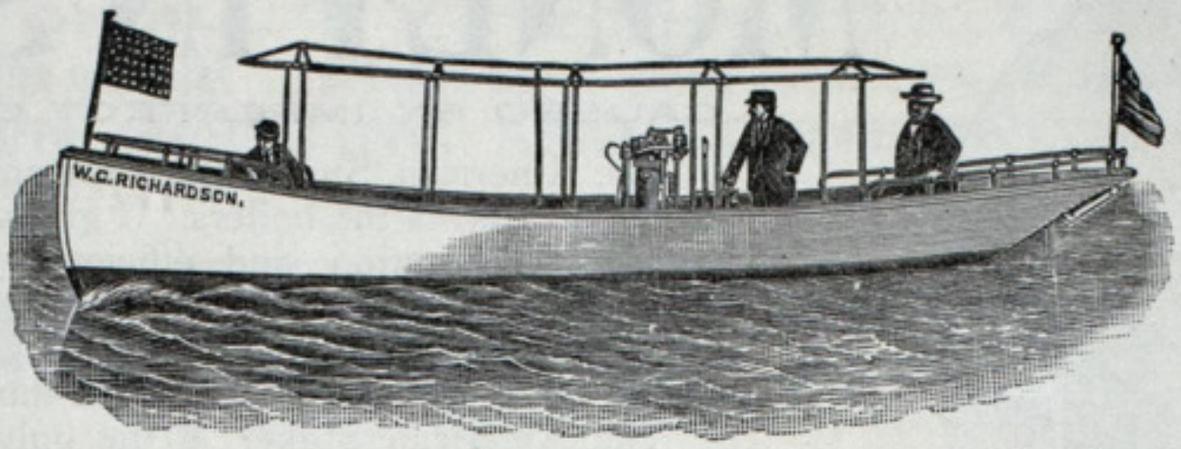

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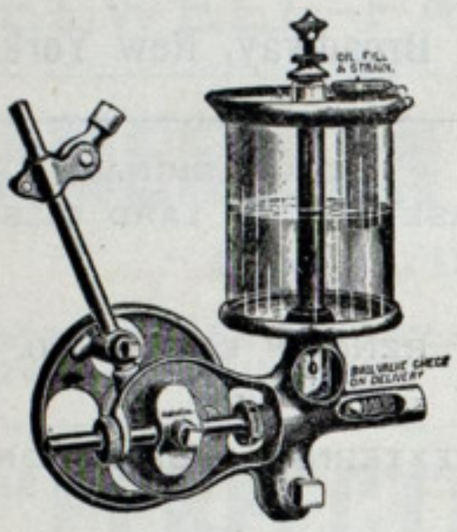

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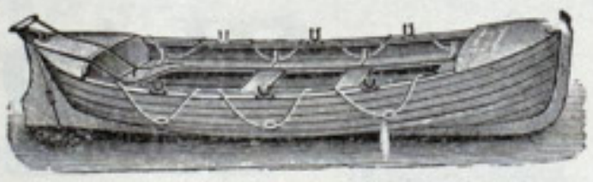

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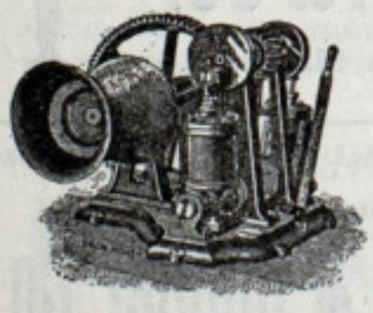

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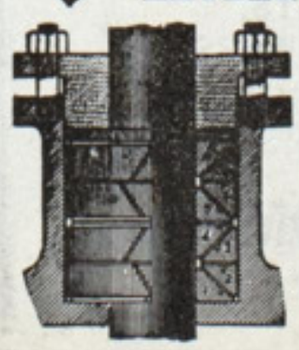

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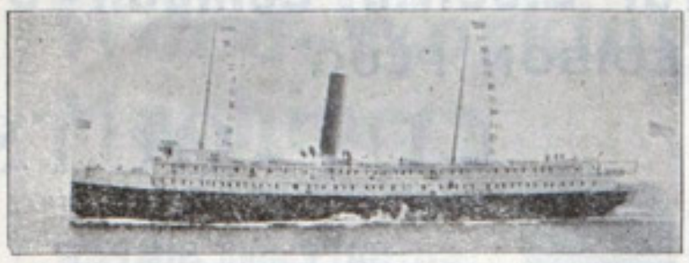

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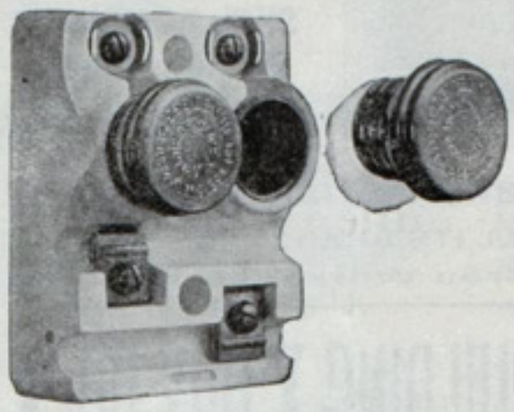

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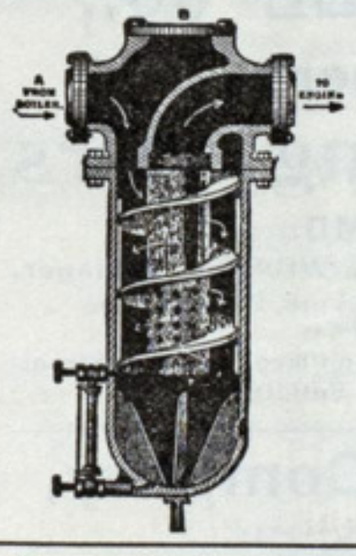

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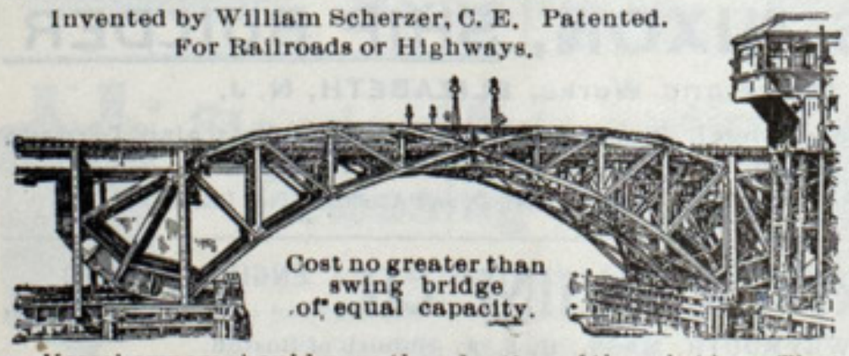

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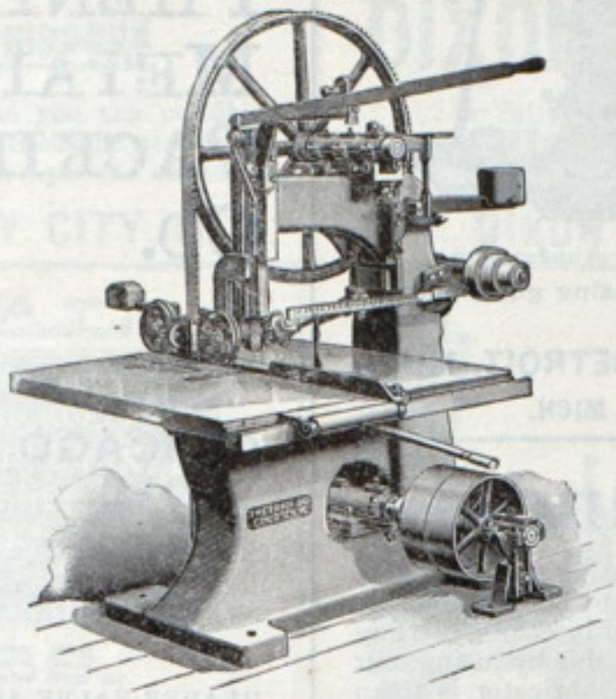

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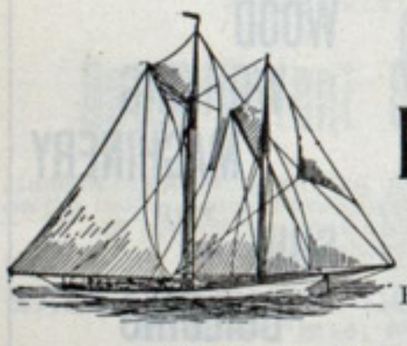

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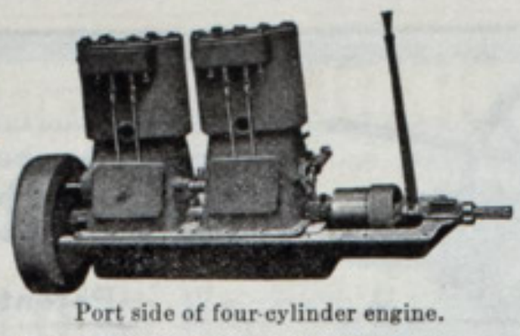

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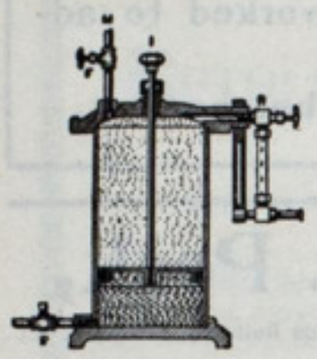

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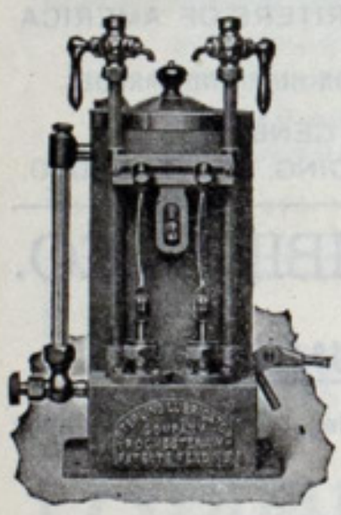

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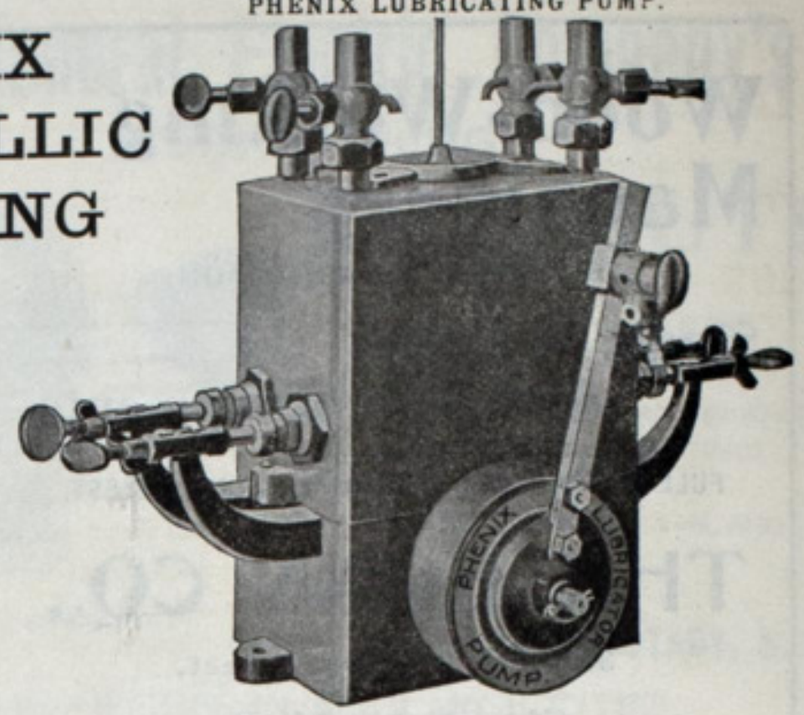

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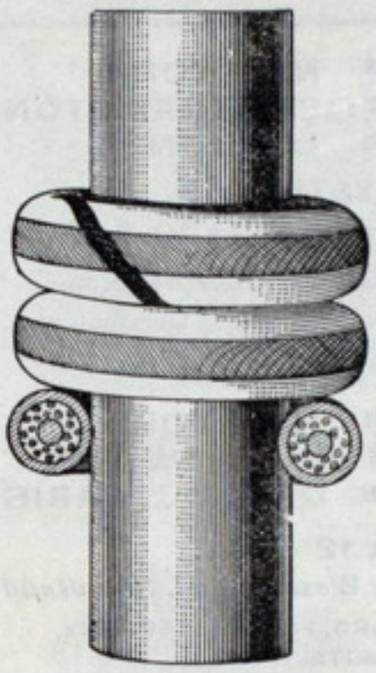

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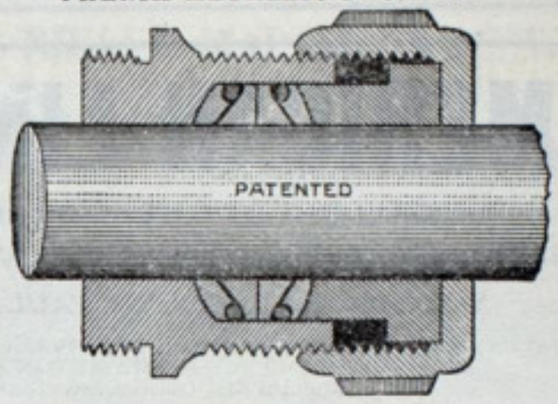

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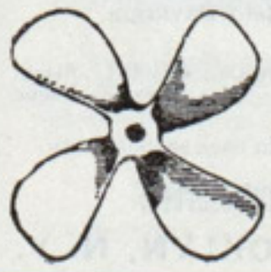

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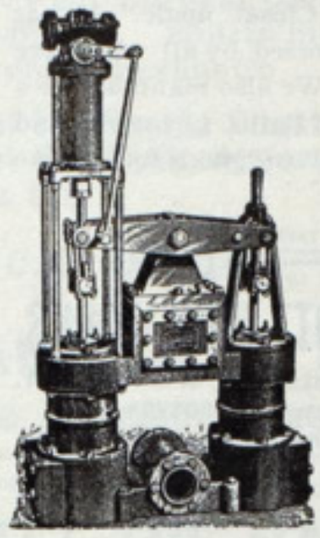

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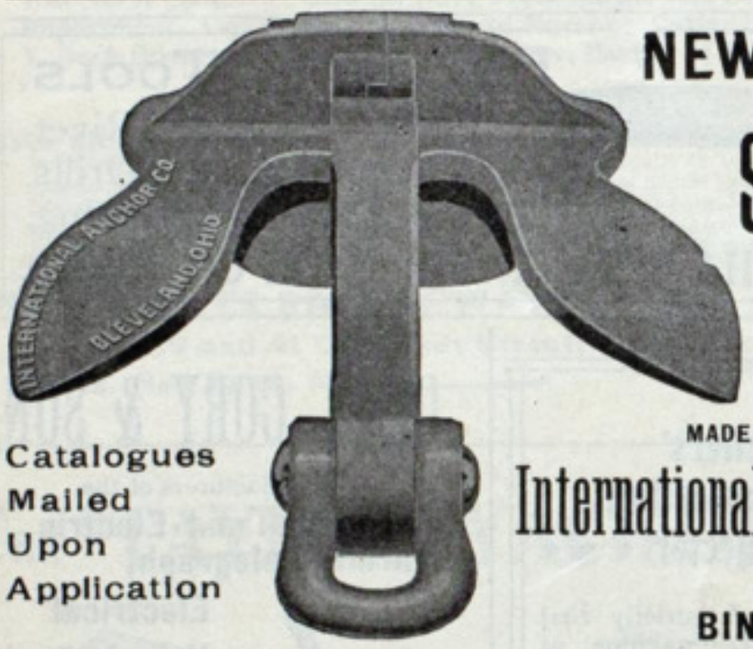

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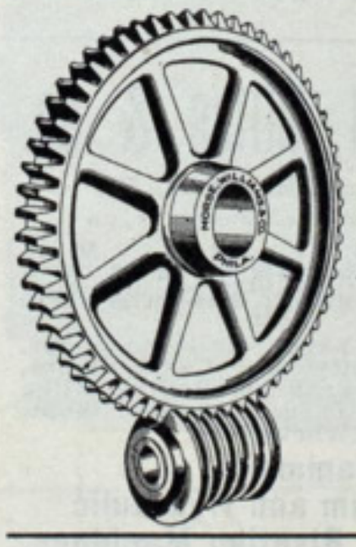

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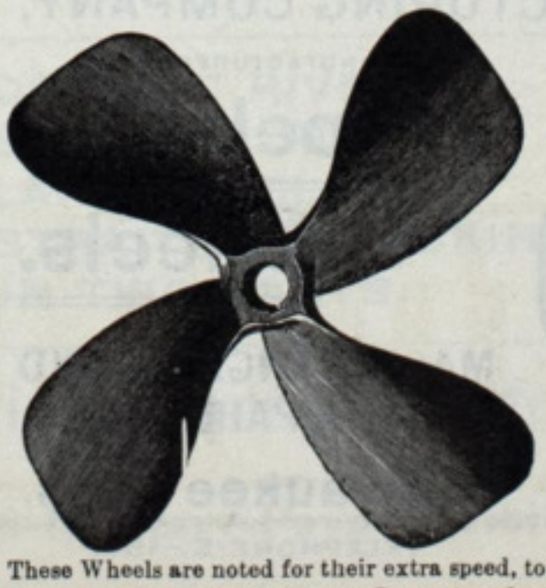

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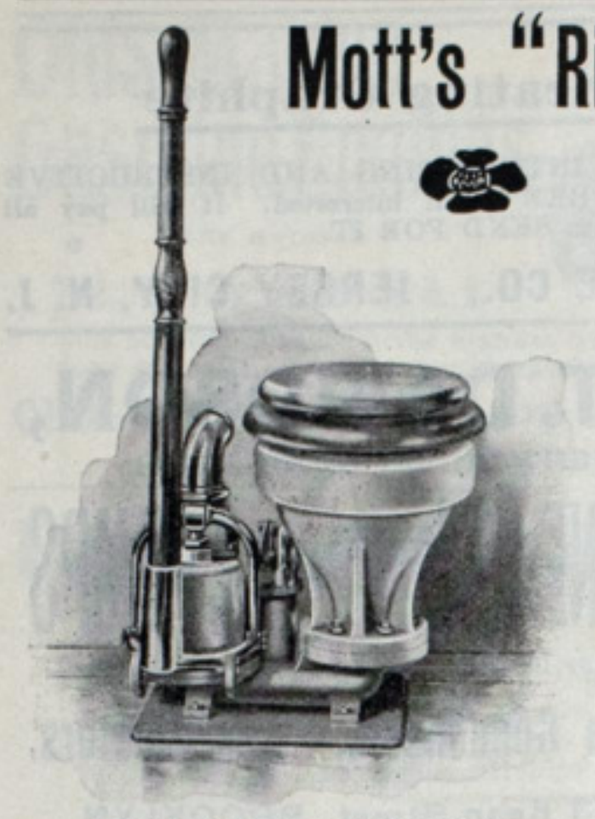

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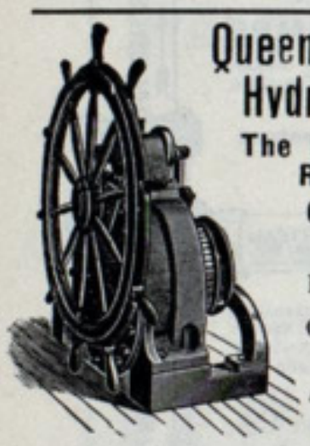

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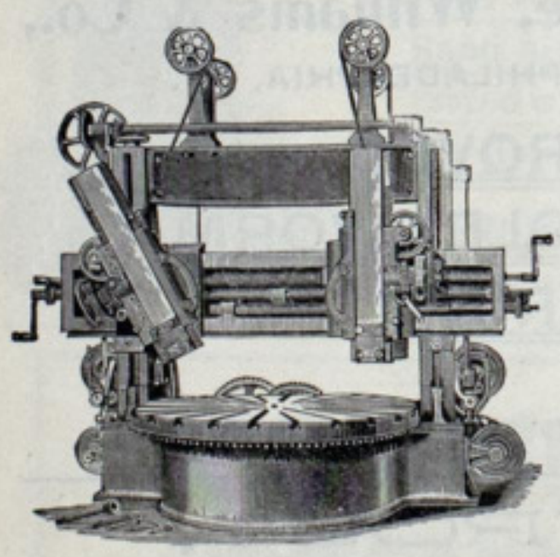

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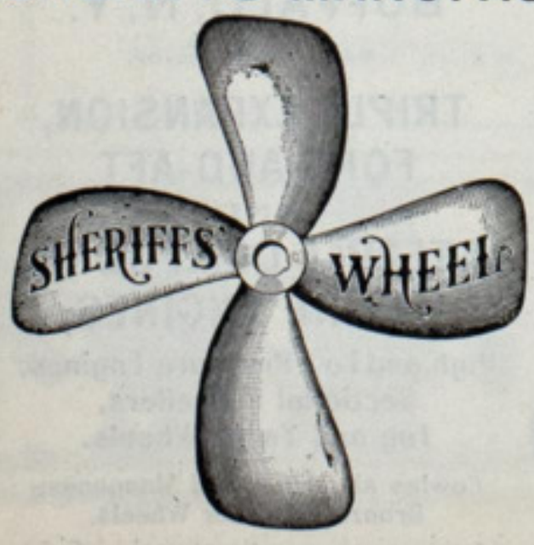

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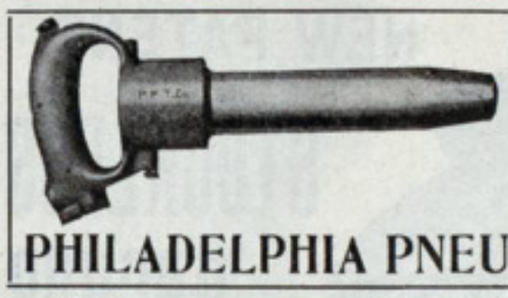

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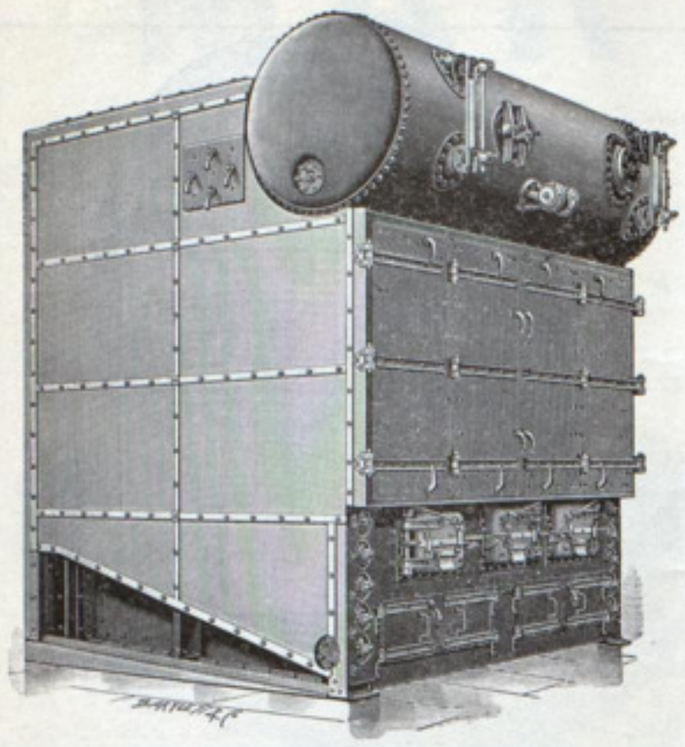

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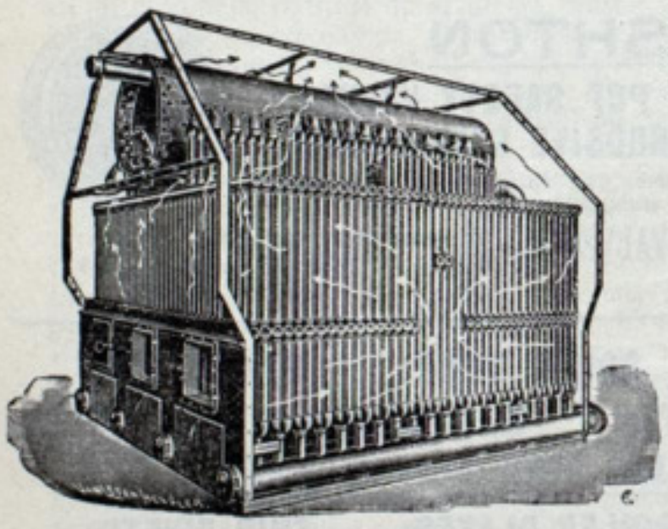

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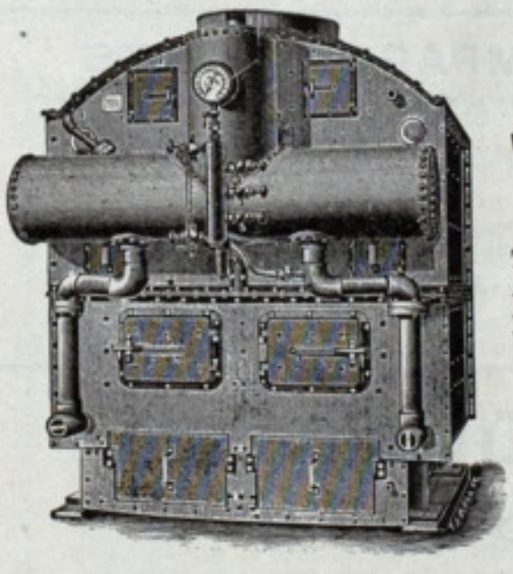

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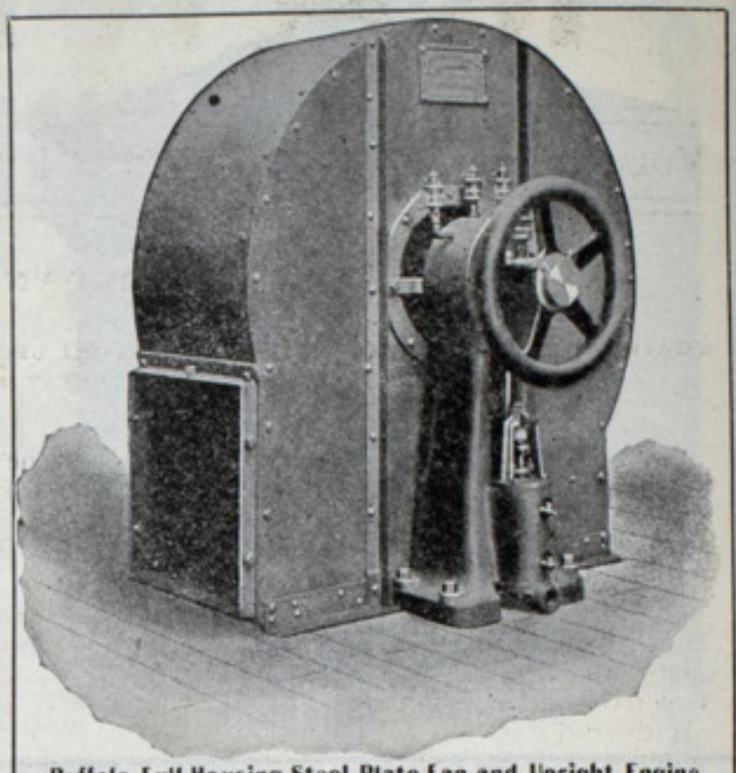

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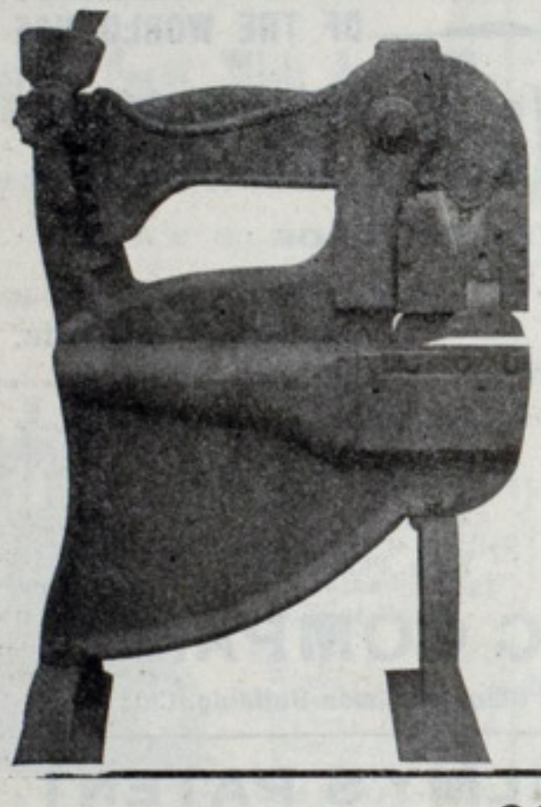

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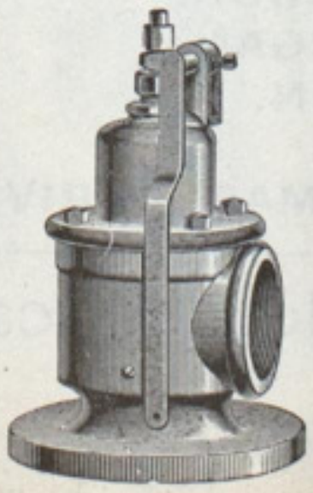

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